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Editor

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Using Team Rewards and Individual Assessment to Incentivize Collaboration in Team Projects

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ABSTRACT

Team projects are commonly used in higher education across different disciplines to promote cooperation among students. However, achieving this objective can be challenging. To address this issue, educators have explored various strategies, such as implementing peer evaluation or having periodic consultations with teams. In this paper, I present a novel approach to team assessment that combines team rewards with individual assessment. In this assessment, each team member independently takes a quiz, and the team's score is determined by the average performance of its members. Consequently, the team reward becomes intricately tied to the individual learning outcomes of all team members. This study offers an exemplary implementation of the proposed assessment scheme within an undergraduate management accounting class and reports students' perceptions of this assessment approach.

Keywords: Team Projects, Group Projects, Assessment, Cooperative Learning

INTRODUCTION

The incorporation of team projects in higher education disciplines has garnered significant attention as an effective pedagogical strategy (Johnson and Johnson, 2009; Jin, 2012). Additionally, accreditation bodies such as AACSB and EFMD have explicitly required business schools to integrate teamwork into their curriculum (AACSB 2017; EFMD 2019). The primary motivation behind utilizing team projects is the potential to enhance students' social skills, including communication, leadership, and collaboration abilities (Norman et al., 2004; Jackling and De Lange, 2009; Bailey et al., 2015). However, reaping the benefits of team projects relies on their effective implementation.

Among the challenges faced by instructors when implementing team projects, the assessment of project work is a crucial issue (Brown et al., 2013; Davies, 2009; Johnson and Miles, 2004). Commonly employed team project assessment methods can lead to undesirable behavior among team members, such as a performance-oriented approach, where each student independently completes their assigned task without engaging in collaboration (Pitt, 2000; Meijer et al., 2020). Furthermore, some members may exhibit free-riding behavior, invest minimal effort in teamwork, or dominate team discussions without considering others' perspectives (Hall and Buzwell, 2013; Hansen, 2006; Opdecam and Everaert, 2018; Simms and Nichols, 2014). Consequently, many students report negative experiences with team projects (Hansen, 2006; Healy et al., 2014; Opdecam and Everaert, 2018).

Motivated by these challenges, this study presents an alternative approach to assessing team projects. Drawing upon the theory of cooperative learning, the proposed assessment requires each team to submit a team report and each team member to take an individual quiz related to the project assignment. Although students take the quiz independently, all team members receive the same scores, which are derived from both the team report and the performance of all team members in the individual quiz.

The proposed assessment method aligns with the theory of cooperative learning, which suggests that group rewards can enhance individual learning when they are based on each member's progress (Slavin, 1995; Slavin, 2012). Specifically, team members are rewarded based on the individual quiz scores of their peers, reflecting their individual learning. The inclusion of the individual quiz component incentivizes teams to prioritize a learning-oriented approach to teamwork, ensuring that all members benefit from the project rather than adopting a performance-oriented mindset.

To gauge students' perception of the proposed assessment scheme, this study employed a questionnaire survey. Participants enrolled in a management accounting course completed a pre-study questionnaire to assess their prior experiences with team projects. Following the completion of the team project implemented in this study, a post-study questionnaire was administered to capture their perceptions of the project. The results indicated that the team project in this study was perceived as more effective than previous team projects in facilitating student learning and peer learning. Moreover, participants reported equal contributions from team members in this project. The findings also suggested that the proposed assessment method promoted team interaction and collaboration, aligning with the objectives of team projects.

This study contributes to the existing literature on education by proposing an alternative assessment approach for team projects and reporting students' perceptions of it. Additionally, the study highlights the potential advantages and disadvantages of the proposed assessment approach. While the approach may foster cooperation and collaboration, students may perceive it as unfair due to its reliance on individual performance. Instructors are advised to consider these factors when implementing the proposed assessment scheme.

ASSESSMENT IN TEAMWORK

Teamwork has become an integral part of university curricula across disciplines (Johnson and Johnson, 2009; Jin, 2012). However, instructors often face challenges when implementing team projects (Hansen, 2006; Opdecam and Everaert, 2018). To address these challenges, De Hei et al. (2016) developed a framework that provides guidance for instructors in implementing team projects, with assessment being one of its key components. Assessment is crucial as it evaluates student learning and motivates students to learn (Gardner, 2012). Despite its importance, research on the assessment of team projects is limited (Forsell et al., 2020).

Commonly used assessment methods in team projects or collaborative learning include group assessment, individual assessment, and group assessment with peer evaluation (Meije et al., 2020). Each method has its pros and cons, summarized as follows:

Group Assessment

Group assessment refers to an assessment in which students work as a team to deliver outputs, and all team members share the same score. Group assessment can be beneficial as it provides students incentives to collaborate and learn from each other (Johnson & Johnson, 1987). Although this type of assessment encourages collaboration, it does not necessarily ensure that students learn from one another. Specifically, students may adopt a performance-oriented approach instead of a learning-oriented approach (Pitt, 2000). For example, the team may divide the task in such a way that each student independently completes their own task. It is also possible that the entire project may be completed by only a few "higher ability" students without collaboration among all members (Conway et al., 1993; Pitt, 2000). Another inherent problem associated with group assessment is the free-riding problem where some team members contribute less than others (Brooks & Ammons, 2003; Hall & Buzwell, 2013; Simms & Nichols, 2014).

Individual Assessment

Another commonly used assessment approach in collaborative learning is individual assessment. In this approach, students work together in teams but are evaluated and rewarded based on individual performance. One clear benefit of this assessment approach is that each individual student is incentivized to exert effort, as they will be graded based on their own performance. However, this assessment method can strongly discourage collaboration and cooperation among team members, as students may view their team members as competitors (Hayek et al., 2015; Wittenbaum et al., 2004).

Group Assessment with Intra-Group Peer Assessment

The final commonly used assessment approach is group assessment with intra-group peer assessment. This type of assessment shares similarities with group assessment, as it involves students working together as a team to deliver team outputs. However, the scores of individual students within the same team may differ due to adjustments made based on peer assessment by other members of the team. In theory, this type of assessment promotes collaboration among team members and encourages them to work hard, as they will eventually be evaluated by their peers within the team. However, studies have demonstrated numerous problems associated with peer assessment (Carvalho, 2013; McConlogue, 2012; Panadero et al., 2013). The validity of peer assessment may be compromised, as it can be influenced by various factors, such as friendship and peer pressure. Additionally, peer assessment may be utilized unfairly to penalize team members whom others dislike or disagree with. Given these issues, the use of peer assessment may not necessarily serve as an effective means of incentivizing students to cooperate.

Proposed Alternative Assessment: Team Rewards and Individual Assessments

In this study, I propose an alternative assessment scheme for team projects that integrates team rewards with individual assessments. This scheme combines group assessment and individual assessment, where teams submit a team report and students take an individual quiz related to the project. Although students take the quiz individually, all team members receive the same score based on the team report and the average score of the individual quiz within the team.

This assessment scheme aims to address the limitations of individual assessment by fostering cooperation and collaboration among team members through the team report component. It also seeks to mitigate the performance-oriented approach found in group assessment by including the individual quiz, where all team members share the same score. Thus, students are incentivized to ensure their team members are actively involved and comprehend the content, promoting a learning-oriented approach to team projects.

The use of group rewards based on group reports and individual assessments also tackles the drawbacks of peer evaluation. Unlike peer evaluation, where students rely on their own judgments, the proposed assessment scheme requires formal assessment of individual learning by the instructor. This encourages cooperation among team members to ensure that all members learn, as rewards are based on the individual learning of the entire team.

However, the proposed assessment scheme has potential drawbacks. It may or may not address the issue of free-riding, as all team members share the same group reward regardless of their individual contributions. It may also raise concerns about fairness, as some students may perceive it as unfair since part of their score depends on their team members' performance in the individual quiz. Therefore, students' perceptions of the proposed assessment scheme in team projects remain uncertain and will be explored in this study.

TEAM PROJECT IMPLEMENTATION

The proposed assessment scheme was implemented in a management accounting course at a university in Singapore during the fall semester of 2019. The course consisted of second-year undergraduate students majoring in accounting, who had prior experience with team project assignments at the university level. A total of 112 students were enrolled in the course, all taught by the same instructor. One of the assessment components in the course was a team project, which required students to form their own teams of 4–5 members each. There were 27 teams in total.

Team Project

The team project assessment accounted for 15% of the total course grade. It comprised two components. The first component involved a traditional team project where students collaborated on tasks and submitted a team report. This component contributed 10% to the total course grade. Students were tasked with addressing questions related to service department cost allocation, journal entries for job order costing, and the application of management accounting concepts to a business entity. In this component, all team members within each team received the same score, determined based on the submitted team report.

Following the submission of the team project reports, each student completed an individual quiz consisting of questions related to the knowledge required for the team project. The average score of all students within each team was then calculated. This average team score constituted the remaining 5% of the total course grade, with all team members receiving the same score. Thus, despite taking the quiz individually, all members of each team were assigned the same score, which was the average score of all team members, for this assessment component.

To summarize, within each team, all members received the same score for the team project assessment component. The score was divided into two parts: 10% of the total course grade was based on the team report, while the remaining 5% was based on the average individual quiz scores of the team members.

STUDENTS' PERCEPTION

To assess students' perception of the proposed assessment scheme, a pre-study and post-study questionnaire were administered. Upon forming their teams, students completed a pre-study questionnaire that gathered demographic information and prior team project experience. After completing the team project, students filled out a post-study questionnaire to provide feedback on their experience with the team project using the proposed assessment scheme. The pre- and post-study questionnaires used in this study were adapted from those used in Bourner et al. (2001), Cadiz Dyball et al. (2007), Healy et al. (2018), and Sridharan et al. (2018) as they have been shown to be able to measure team project experience. Out of the 112 students enrolled in the course, 102 of them (91.07%) completed both the pre-study and post-study questionnaires. Among these students, 31 were male (30.39%) and 71 were female (69.61%).

Comparing Team Project Experiences
The study examines the differences in students' perceptions of team projects based on their prior team project experiences and their experience with the team project implemented in this study. Students were presented with

statements and asked to rate the extent to which they agreed with them. In the pre-study questionnaire, students rated their perceptions based on their prior team project experiences, while in the post-study questionnaire, they rated their perceptions based on the team project experience in this study. A Likert scale ranging from 1 to 7 was used, with 7 indicating "strongly agree" and 1 indicating "strongly disagree."

Based on the students' responses, compared to their prior team project experiences, the team project used in this study was perceived to provide a better learning experience (mean of 5.26 for this project vs. 4.50 for previous projects), be more beneficial (mean of 5.23 for this project vs. 4.36 for previous projects), and be more enjoyable (mean of 5.12 for this project vs. 4.13 for previous projects). Additionally, students found that the team project in this study was more stimulating (mean of 5.28 for this project vs. 4.30 for previous projects), more creative (mean of 5.00 for this project vs. 3.92 for previous projects), more satisfying (mean of 5.02 for this project vs. 3.90 for previous projects), and easier (mean of 4.06 for this project vs. 3.03 for previous projects). Moreover, students perceived that the team project in this study better facilitated learning from other students (mean of 5.75 for this project vs. 5.44 for previous projects) and helped them gain a deeper understanding of the subject area (mean of 5.20 for this project vs. 4.81 for previous projects). Overall, students perceived that the team project in this study effectively enabled and encouraged cooperative learning.

Furthermore, students perceived that the grading allocation for the project in this study was fairer compared to their prior team project experience. Specifically, they agreed less strongly with the statement "Some individuals got higher marks than they deserved for the team project" (mean of 4.84 for this project vs. 5.35 for previous projects). Similarly, they agreed less strongly that "Some individuals got lower marks than they deserved for the team project" (mean of 4.75 for this project vs. 5.07 for previous projects). These results suggest that team members tended to contribute equally to the team project in this study. The summarized results are presented in Table 1.

Table 1: Comparison of Team Project Experiences between Prior Projects and the Project used in this study

My experience with teamwork is:	Pre-Study	Post-Study	t-statistic
A good learning experience	4.5000	5.2647	5.5675***
Beneficial	4.3627	5.2255	6.3184***
Enjoyable	4.1275	5.1176	5.5579***
Stimulating	4.3039	5.2843	7.0725***
Very creative	3.9216	5.0000	7.1961***
Satisfying	3.9020	5.0196	7.3441***
Easy	3.0294	4.0588	6.348***
I agree with the following statement:	**Pre-Study**	**Post-Study**	**t-statistic**
Teamwork helped me to get to know other students	5.5098	5.4412	-0.49688
Teamwork enabled me to learn from other students	5.4412	5.7549	2.6178**
I learn more about the subject area from individual assignments than from teamwork	5.1863	5.2745	0.58272
Teamwork helped me to learn more about the subject area	4.8137	5.1961	2.7856***
The team reports were of higher quality than if we had done them individually	4.7745	5.0000	1.2099
Teamwork requires more time than individual assignments for the marks involved	5.8137	5.7157	-0.66633
Some individuals get higher marks than they deserve in teamwork	5.3529	4.8431	-3.3863***
Teamwork requires more effort than individual assignments for the marks involved	5.6961	5.5294	-1.3451
Some individuals get lower marks than they deserved in teamwork	5.0686	4.7451	-2.2861**
I don't mind working in teams provided I'm individually assessed	4.3431	4.4216	0.59111

***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed statistics.

Perception of Team Dynamics under the Proposed Assessment Scheme
As discussed earlier, the assessment scheme for the team project in this study comprised a team component and the average of the individual assessment. Given the unique nature of this assessment scheme, it is crucial to examine its impact on how students worked within the team project. Students were presented with a set of statements and asked to rate their level of agreement with each statement. These statements emphasized the interactive and cooperative nature of team projects, as well as individual accountability. Examples of the statements included, "This assessment

scheme allowed me to share information with my team effectively," "This assessment scheme encouraged me to work harder," and "This assessment scheme helped me better understand and apply concepts learned from my peers." The students rated each statement using a Likert scale ranging from 1 to 7, where 7 indicated "strongly agree" and 1 indicated "strongly disagree."

The results indicated that, overall, students perceived the assessment scheme to have a positive impact on peer interactions and cooperation within the team project assignment. The average scores for all the questions ranged from 4.725 to 5.618. The statement with the highest average score was "This assessment scheme encouraged me to work harder," aligning with the notion that this assessment scheme promotes individual accountability. Other statements that received high average scores included "This assessment scheme enabled me to make quality contributions," "This assessment scheme enabled me to learn more," and "This assessment scheme encouraged discussions between me and my team." These results suggest that the proposed assessment scheme fostered collaboration among team members. A summary of the average ratings is provided in Table 2.

To further investigate the perception of team dynamics under the proposed assessment scheme, teams were divided into two categories: high academic-ability teams and low academic-ability teams. This categorization was based on their average midterm exam scores. Out of the 27 teams, 13 were classified as high academic-ability teams, having scores above the median, while the remaining 13 were classified as low academic-ability teams, with scores below the median. (The team representing the median point was excluded from this analysis.) Conventionally, it would be expected that high academic-ability teams outperform low academic-ability teams in the individual quiz portion of the team project. Surprisingly, the results revealed that out of the 13 low academic-ability teams, 4 of them scored above the median in the individual quiz assessment. Conversely, among the 13 high academic-ability teams, 6 of them scored below the median in the individual quiz assessment.

I further identified the 4 low academic-ability teams that performed well in the individual quiz assessment (referred to as $HighQuiz_{Weak}$) and the 6 high academic-ability teams that performed poorly in the individual quiz assessment (referred to as $LowQuiz_{Strong}$) to compare their perceptions of team dynamics. The results presented in Table 2 indicate that low academic-ability teams that performed well in the individual quiz assessment tended to have a more positive experience in this team project assignment compared to high academic-ability teams that did not perform well in the individual assessment, although these differences were not statistically significant. These findings provide some evidence that a positive team project experience and interaction among team members can enhance the learning process for students.

Table 2: Students' Perception of the Impact of the Assessment Scheme Used in this Study on Team Dynamic

This assessment scheme:	**Overall Mean**	*LowQuiz_{Strong}*	*HighQuiz_{Weak}*
allows me to share information with my team effectively	5.0590	5.2000	4.8750
enables me to collaborate with my peers	5.3820	5.3000	5.3125
enable me to learn from my peers	5.3730	5.2500	5.4375
helps me to better understand and/or apply concepts learned from my peers	5.3920	5.1000	5.5625
improves my interaction with my peers	5.4510	5.2000	5.6250
enables my team to work towards a common goal effectively	5.4900	5.2000	5.6250
encourages discussions between me and my team	5.5100	5.3000	5.7500
helps my team establish team goals effectively	5.1760	5.0500	5.3125
is fair	4.8040	4.5000	4.8750
enables team members to distribute the work equitably	4.9710	4.6000	4.5625
prevents team members from free riding	4.7250	4.4500	4.6250
helps me to improve my understanding of group dynamics	5.3140	5.2000	5.3125
teaches me to communicate better with my team members	5.3040	5.1500	5.5000
teaches me to resolve any conflicts with the team members	5.0290	5.0000	4.7500
enables me to make quality contribution	5.5880	5.5000	5.6875
encourages me to work harder	5.6180	5.8500	5.6875
enables me to learn more	5.5200	5.2000	5.7500

LowQuiz$_{Strong}$ is the average response of students who are members of the teams with the average midterm exam scores above the median (high academic-ability teams) but the average individual quiz scores from the project below the median.
HighQuiz$_{Weak}$ is the average response of students who are members of the teams with the average midterm exam scores below the median (low academic-ability teams) but the average individual quiz scores from the project above the median.

Open-Ended Responses
In addition to rating their perceptions on the Likert scale, students were given the opportunity to provide open-ended responses, sharing what they liked best and least about the project.

When asked about what they liked best, several students emphasized the collaborative aspect of the team project and the opportunity for peer learning. Examples of responses include "Learning from my teammates on concepts that I am weaker in," "Brainstorming together," and "Those that are stronger in the concepts could guide me along as I'm weaker in the module for some specific concepts required during the project." Furthermore, some students specifically mentioned their appreciation for the individual quiz component. Examples are "Even though I'm worried, I actually like the quiz part because it spurs us to help one another in order to make sure everyone understands." and "I like how the 5% assessment forces all of us to actually contribute something to the project itself." These responses provide evidence that the assessment scheme used in this project helped encourage collaboration and peer learning activities.

Regarding what they liked least about the project, common responses included the difficulty of the project requirements and challenges encountered while working with team members. Notably, a few students expressed dissatisfaction with the individual quiz component, as they believed it might not be fair for everyone. This finding highlights a limitation of the assessment scheme and suggests that instructors should carefully consider the benefits and costs associated with such an assessment method before implementing it.

DISCUSSIONS AND LIMITATIONS

Assessment in team projects has always presented a challenge for instructors. While the primary goal of team projects is to foster collaboration among students, designing an assessment scheme that effectively measures and rewards collaboration can be complex. The collaborative process itself is not easily observable by instructors, leading to potential perceptions of unfairness or misalignment between assessment approaches and intended outcomes. It is crucial to recognize that there is no one-size-fits-all perfect assessment scheme for team projects. Instructors must carefully consider the advantages and disadvantages of different assessment approaches and choose the one that aligns best with their objectives.

The proposed assessment scheme, which utilizes team rewards based on individual assessment, aims to incentivize collaboration and peer learning. Instructors who prioritize student learning through collaboration may find this assessment scheme beneficial. However, it is important to acknowledge the limitations of this approach. Some students may perceive the assessment as unfair if they do not derive significant benefits from the peer learning aspect of the assignment. To address this concern, instructors should clearly communicate the purpose of the assessment scheme to students and provide guidance that facilitates effective collaboration among team members.

CONCLUSIONS

While team projects have been widely incorporated into course assessments across various disciplines, some studies have revealed that students often have negative experiences with such projects. This negativity may stem from the lack of direct rewards for cooperation among team members. This study proposes an alternative assessment method that addresses this drawback of team projects. Specifically, the proposed assessment scheme assigns team scores based on both the team report and the average scores of individual assessments for each team member.

The design of this assessment scheme draws upon the theory of cooperative learning, which has demonstrated its effectiveness in improving student learning outcomes. To enhance the cooperative learning experience, team rewards must be linked to the individual learning of each team member. By integrating this reward system into the assessment of team projects, it is expected that team members will collaborate and support each other's learning, as each member's score is influenced by the learning of the entire team.

Based on the questionnaires completed by the students, it was found that this team project was more successful in educating students about the subject area and facilitating peer learning compared to their previous team project experiences. Furthermore, students perceived that the assessment scheme used in this project encouraged interaction and collaboration within teams and motivated them to invest more effort.

Overall, this research provides valuable insights into an alternative assessment scheme for team projects that promotes collaboration and individual learning. It underscores the importance of aligning assessment strategies with the intended learning outcomes and highlights the need for ongoing communication and guidance to ensure students understand and engage effectively with the assessment scheme.

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Self-Guided Application in the Data Analytics Curriculum

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ABSTRACT

Over the past two decades, the accounting profession has experienced steadily increasing demand for college graduates with data analytics skills. Universities have responded in kind by creating analytics courses for their accounting tracks. In our view, a weakness of current available textbooks on this subject matter is that textbook content generally employs guided learning with step-by-step instructions to completion. We have developed a self-guided application that allows students to develop and practice data analytics skills with minimal instruction. We find that students perceive the application as a learning supplement to the skills developed in the course, that the model employed is useful for data analysts, and that oral communication skills are valuable for data analysts.

Keywords: Accounting curriculum; data analytics skills; survey; accounting analytics; SEC EDGAR

INTRODUCTION

The accounting discipline has experienced a rapid evolution in the past two decades due to increases in computing power, data capacity, and automation of accounting tasks (Huerta and Jensen, 2017). In response to these changes, the American Institute of Certified Public Accountants (AICPA) and the National Association of State Boards of Accountancy (NASBA) have developed coming changes to the CPA exam entitled the "CPA Evolution Model Curriculum". The proposed changes include "Accounting and Data Analytics" as one of its three core tenets, "Business Analysis and Reporting" and "Information Systems and Controls" as two of three disciplines. Each of these areas directly references data analytics skills that will be tested on future CPA examinations.

The presence of "Big Data", that is, data with greater variety with increasing volume and velocity (Laney, 2001), is transforming both the accounting practice (Apostolou et al., 2016, Warren et al., 2015) and the accounting curriculum (Sledgianowski et al., 2017). This "Big Data" and developments in analytics technology have expanded the use of software beyond automating existing manual processes and methodologies (Liu and Vasarhelyi, 2014; Gamage, 2016). Accounting has always been a data-driven discipline, and with new analytics tools at our disposal, the accounting profession has been presented with both opportunities and challenges (Stein Smith, 2017). Accounting literature has recommended that data analytics be added to the curriculum (Janvrin and Watson, 2017) and for Masters courses in particular to develop questioning skills and skepticism, critical thinking skills, understanding and analysis of data, and communication skills (Mcbride and Philippou, 2021). Richardson and Shan (2019) surveyed 159 accounting department chairs and found that 90.7% believe there should be a data analytics course in the accounting curriculum and that 84.5% plan on providing at least one standalone course in data analytics.

With the increase in accounting data analyticstops course offerings, textbooks targeting the accounting discipline within the analytics space have begun to compete with one another. Within current accounting analytics textbooks (Richardson et al., 2021; Dzuranin et al., 2022), both assignments/labs and problems/projects incorporate a step-by-step process to guide the student through specific actions when managing data. Data Analytics cases currently published follow a similar pattern, providing students with specific steps in data cleaning and analysis (Cainas et al., 2021; Cheng et al., 2021; O'Brien and Stone, 2021). A recently published case study by Cheng et al. (2023) is a good example of the step-by-step approach which requires minimal in-class time and offers an approachable solution for instructors who have limited class time and no data analytics background. We posit that students in current data analytics courses in accounting are not provided with enough opportunities to freely practice analytics skills in their coursework. We argue that to fully develop analytics skills, students need to further practice and demonstrate questioning skills, critical thinking, data analysis skills, and communication skills beyond the guided assignments currently included in textbook materials.

In our course, Data Analytics for Accounting (ACCT 5375), we use the textbook "Data Analytics for Accounting" By Richardson, Teeter, and Terrell (Richardson et al. 2021). This textbook is centered around the IMPACT Model, which closely resembles the scientific method. The steps in the IMPACT Model, which is the approach to data analytics in the textbook, are the following: Identifying the questions (I), Mastering the data (M), Performing the test plan (P), Analyzing the results (A), Communicating results and visualizations (C), and Tracking outcomes (T). The accompanying coursework with the textbook follows guided processes that introduce the student to the IMPACT Model and software that data analysts employ – particularly Excel, Access, Tableau, and Power BI.

We have created a self-guided application, which we refer to as the "project", that allows students to practice data analytics skills with minimal instruction. This project supplements the labs, end-of-chapter material, and assignments in chapters 10 and 11. While this version of the project was developed with the Richardson, Teeter, and Terrell text in mind, it can be easily adapted to other analytics textbooks by removing reference to the IMPACT Model and replacing it with scientific method equivalents. Our project and accompanying survey aim to target the skills listed above from Mcbride and Philippou (2021). This does not imply that current textbooks avoid developing these skills – rather, our self-guided application is intended as a supplement to skill development already present in analytics textbooks. The project, in its entirety, is included in appendix A and the survey sent to students is provided in appendix B.

MATERIALS AND METHODS

Our goal is to supplement data analytics skills developed in traditional data analytics coursework by providing students with an opportunity to explore software introduced in the course such as Excel, Access, Tableau, and Power BI. Students also gain exposure to the scientific method via the IMPACT Model (Richardson et al., 2021) and develop key oral communication skills that are an essential part of the work of data analysts.

Extant literature has discussed the necessity of analytics mastery and skills needed when entering the accounting profession (Augustine et al., 2020; Kavanagh and Drennan, 2008). Gartner's Business Analytics Framework is cited as a guide for necessary capabilities, including: (1) decision making capabilities such as collaborative decision making, intelligent decision automation, and applications, (2) analytic capabilities including descriptive, diagnostic, predictive, and prescriptive analytics, and (3) information capabilities to describe, organize, integrate, share, govern, and implement data (Chandler et al., 2011). PricewaterhouseCoopers' recommendations for undergraduate curriculum changes have served as a baseline within the extant literature for skills development, which includes legacy technologies (e.g. Microsoft Excel and Access), data cleaning, data visualization, machine learning, and predictive tools, among others (PWC 2015). Richardson, Teeter, and Terrell's IMPACT Model, along with other textbook analytics models, purport to develop these skills and our project acts as a supplement to this approach.

These goals and extant literature lead to the following hypotheses:

H_1: Do students perceive self-guided application in the Accounting Data Analytics curriculum as a supplement to traditional step-by-step learning?

H_2: Do students perceive the IMPACT Model as a useful method for data analytics?

H_3: Do students perceive oral communication skills as valuable skills for data analysts?

We investigate the above questions by surveying students across two semesters of Data Analytics in Accounting. The following items comprise the survey (survey provided in Appendix B in its entirety):

    (1) Do you feel that the project helped you explore Tableau and/or Power BI features?
    (2) Do you feel the project helped you reinforce the skills you developed in the labs?
    (3) Did SEC EDGAR provide sufficient data for your research question?
    (4) Do you feel that oral presentation skills, such as those you demonstrated in the project, are valuable skills for data analysts?
    (5) Did you follow the IMPACT Model in the proper sequence when performing data analysis, or take a different approach?

Questions 1 and 2 were created to test hypothesis 1, questions 3 and 5 to test hypothesis 2, and question 4 to test hypothesis 3.

We assigned the survey to students for extra credit via the Blackboard survey platform with five questions regarding the project. There were 15 students in the spring semester of 2022 and 33 students in the fall semester of 2022. There was a 98% response rate for the survey. To ensure a high response rate and reliability of results, we took the following measures: (1) Out of the 200 total points for the project, 20 points were awarded for the feedback survey. The project constitutes 27% of the total grade for the class. (2) The students were ensured that the professor would not look at or grade the survey until final grades for the actual project had been recorded and posted. (3) The survey was limited to five questions to mitigate effects of response weariness. (4) All responses yielded full credit.

Questions 1-4 were evaluated on a Likert Scale (Likert, 1932), including the following responses: strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, and strongly disagree. In addition to multiple choice responses, the students are allowed to include comments about a particular question or any additional comments or concerns apart from the questions. In accordance with prior pedagogy literature employing survey questions (Stoica and Florea, 2020; Kavanagh and Drennan, 2008; Thomas, 2012) and as recommended by Nunnally (1978), we use Cronbach's Alpha (Cronbach, 1951) to measure the internal consistency of the questions we claim address the same concept.

RESULTS AND DISCUSSION

The responses to the feedback survey are listed in Table 1. Below is a short discussion of each question and the accompanying results.

Table 1: Feedback Results

Answer/Feedback	Question 1		Question 2		Question 3		Question 4	
	N	%	N	%	N	%	N	%
Strongly Agree	23	48.94%	32	68.09%	22	46.81%	33	70.21%
Somewhat Agree	14	29.79%	11	23.40%	12	25.53%	9	19.15%
Neither Agree nor Disagree	6	12.77%	1	2.13%	5	10.64%	4	8.51%
Somewhat Disagree	4	8.51%	1	2.13%	8	17.02%	1	2.13%
Strongly Disagree	0	0.00%	2	4.26%	0	0.00%	0	0.00%
Total	47	100.00%	47	100.00%	47	100.00%	47	100.00%

Answer/Feedback	Question 5	
	N	%
IMPACT Model	42	89.36%
Other Approach	5	10.64%
Total	47	100.00%

Do you feel that the project helped you explore Tableau and/or Power BI features?

Our first question aims to gauge student familiarity with Tableau and/or Power BI that either goes beyond what is covered in the textbook, or is covered in the textbook but the students felt they did not have time to experiment with those features. There is a somewhat high positive response rate on the Likert scale for question 1 (78.73% including strongly agree and somewhat agree), indicating support for H_1.

Do you feel the project helped you reinforce the skills you developed in the labs?

The labs are directed towards developing mastery of the IMPACT model and the different software typically employed by data analysts by providing step-by-step instructions on the extract, transform, load process and cleaning/analyzing data to develop appropriate visualizations. We find a high Cronbach's Alpha ($\alpha = .9137$) relative to literature standards

for reliability ($\alpha > .7$), indicating strong internal consistency for the first two questions of the survey. Students also had a high positive response rate for question 2 (91.49% total), indicating support for H_1.

Did SEC EDGAR provide sufficient data for your research question?

If students follow the IMPACT Model in sequence, they may find that asking questions first leads to an unanswerable hypothesis. This can be due to data that is not present in financial reports located on SEC EDGAR, missing data in those reports, or difficulty locating the appropriate data once loaded, amongst a plethora of other possibilities. This question aims to determine if students were able to develop or possibly revise their question so that it is answerable within the context of the database. There is a dispersion of responses for question 3 on the Likert scale (46.81%, 25.53%, 10.64%, 17.02%, 0%), which is not a strong indicator for H_2 (We consider a strong indicator to be >75% positive response rate). This does imply that students are following the IMPACT Model in proper sequence, however, as questions must be stated first before performing tests or analyzing data.

Do you feel that oral presentation skills are valuable skills for data analysts?

Many analytics texts focus on software mastery, data mastery, and data visualization, but rarely convert these skills into a presentation format such as PowerPoint, relying on the dashboards created in Tableau and Power BI. Students need to be able to articulate their findings following the identification of a relevant business question and data analysis (McKinney et al., 2017). There is a positive response rate on the Likert scale for question 4 (89.36%), indicating support for H_3.

Did you follow the IMPACT Model in the proper sequence or take a different approach?

The purpose of the question above is to determine whether students follow the IMPACT Model or if they perform tests and analyze data *first* and then develop their research questions *afterwards*. We also ask this to determine if the students follow the process they learned throughout the course or use their own method they may have developed or learned elsewhere. We find a significant positive response on usage of the model (89.36%), indicating support for H_2. We find a low Cronbach's Alpha ($\alpha = .4832$) relative to literate standards for reliability, indicating weak internal consistency between questions 3 and 5. We therefore do not consider question 3 to be supportive of H_2.

LIMITATIONS

Data Analytics coursework, including this self-guided application, tend to focus on structured data such as Excel files or SQL databases. The self-guided application listed above uses SEC EDGAR rather than having students create their own database through research. Because SEC EDGAR is a well-defined financial database that allows direct extraction to Excel, students do not get exposure to unstructured data via this project.

Richins et al. (2017) state, "Accountants are in a prime position to take a lead role in the problem driven analysis of unstructured data." They argue that structured data analysis is under threat of automation, but accountants with analytics skills pertaining to structured data will heightened job security in the coming years. Therefore, the project could develop additional skills needed for data analysts by implementing an unstructured database approach.

Finally, our study is designed to assess students' perception about the benefits of this self-guided application to data analytics. The results of our survey are thus limited because they do not measure learning gains. As a result, we highlight the importance of examining whether an implementation of a self-guided approach to data analytics in the accounting curriculum is associated with learning gains. We hope future research sheds light on this relation.

CONCLUSION

We find that students in a Masters Accounting Data Analytics course perceive our self-guided application as a supplement to traditional step-by-step learning. We also find that the students perceive the IMPACT Model in the Richardson et al. (2021) book as a useful tool for performing data analytics. Finally, we note that while written communication skills are developed in the book, there are no oral communication requirements. The self-guided application has students present their findings in an oral recording. We find support for their recognition of the need to also develop oral communication skills, and this project helps bridge that gap.

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Appendix A: Self-Guided Application

Data Analytics Project – Spring 2022

In this project, you will have a chance to explore Tableau, Excel, and/or PowerBI and develop your own data visualizations using the SEC EDGAR database. You are tasked with employing the IMPACT model from our text and presenting each step (or potential step, such as the case with tracking outcomes) in a brief 10-15 minute presentation. Here is a rough outline:

I. State your research question and why you chose it. Select and use a business with at least 5 years of prior data. Also pick a competitor and analyze the differences between the firms based on your research question and using the techniques you learned in class.

Some example questions:

What is the impact of COVID-19 on the retail industry? Did some retail firms fare better than others? Compare Walmart and Target's net income, sales, and other measures of financial performance. Show trends before and during the pandemic.

Do firms in the tech industry have trouble collecting on debts owed to them? Which tech firms have smaller relative allowances for uncollectible accounts? Consider comparing uncollectible account balances relative to receivables for Apple and Microsoft or Amazon and eBay. Calculate accounts receivable turnover for each and show trending 5-year data.

II. Outline the process of selecting and cleaning your data. This may include screenshots of data cleaning, a list of steps taken, or, preferably, a table that shows how you narrowed down the database to the needed data attributes.

III. Include at least two data visualization techniques used in this class to show your analysis and answer your research question. These should be clear and concise.

IV. Indicate how data might be tracked moving forward and suggest how your data could be used for forecasting, if applicable. Hint: If you were the data analyst for this business and were going to be asked the same question for the years to come, how would you save yourself time in the future?

V. Conclude by succinctly restating your results and suggesting alternate data that could help you better answer the research question, along with potential avenues of acquiring that data.

To stay consistent with the focus of the course, choose a business or industry where financial data are available. Ask a research question following an accounting topic while employing financial data in your analysis. Qualitative data are allowed if needed but should not be the only means of answering your research question.

Take screenshots of the database you created using SEC EDGAR, data cleaning, and your data visualizations and upload these items as additional attachments with your video. I will create a short video explaining how to extract data from the EDGAR database and will post it on Blackboard.

Database:

SEC EDGAR – (link provided to students on instructional video within Blackboard course shell)

Appendix B: Project Feedback Survey

Q1. Do you feel that the project helped you explore Tableau and/or Power BI features?

    A. Strongly Agree
    B. Somewhat Agree
    C. Neither Agree nor Disagree
    D. Somewhat Disagree
    E. Strongly Disagree

Q2. Do you feel the project helped you reinforce the skills you developed in the labs?

    A. Strongly Agree
    B. Somewhat Agree
    C. Neither Agree nor Disagree
    D. Somewhat Disagree
    E. Strongly Disagree

Q3. Did SEC EDGAR provide sufficient data for your research question?

    A. Strongly Agree
    B. Somewhat Agree
    C. Neither Agree nor Disagree
    D. Somewhat Disagree
    E. Strongly Disagree

Q4. Do you feel that oral presentation skills, such as those you demonstrated in the project, are valuable skills for data analysts?

    A. Strongly Agree
    B. Somewhat Agree
    C. Neither Agree nor Disagree
    D. Somewhat Disagree
    E. Strongly Disagree

Q5. Did you follow the IMPACT Model in the proper sequence when performing data analysis, or take a different approach?

Note on IMPACT Model: Identifying the questions (I), Mastering the data (M), Performing the test plan (P), Analyzing the results (A), Communicating results and visualizations (C), and Tracking outcomes (T).

    A. IMPACT Model
    B. Other Approach

Lessons Learned from the Design of a Business Analytics Minor: What's in it for Accounting and Other Majors?

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ABSTRACT

Motivated by the idea that existing analytics courses can help to fulfill the needs of accounting and other business programs, this paper reviews relevant definitions, literature, and curricula to frame the content and coursework of undergraduate business analytics (BA) minor programs. Business analytics goes beyond business statistics - it refers to a broader set of concepts concerning data-driven decision-making and the technical and analytical skills needed to access and interpret data to gain business insights. In addition, business analytics differs from data science - it employs tools that are accessible to business users, aiming to supplement business skills with analytical skills. From a process perspective, it covers techniques ranging from data acquisition to visualization and reporting, and includes descriptive, predictive, and prescriptive analytics methods. In sum, it is more than just analytics skills or software tools inserted into classes; and as such, it can provide for a holistic supplement to accounting curricula or for any business major.

Keywords: Business analytics, analytics minor, data science, business education, accounting curricula

INTRODUCTION

Business analytics (BA) curricula cover many of the skills and software tools deemed to be important to accounting and other business professionals. But what exactly is a business analytics minor and what does it have to offer? This paper pivots off a recent curricular design to frame the content of undergraduate BA minor programs, reviewing definitions, literature, and curricula to offer insight into the focus and purpose of BA coursework. In doing so, it reveals how a BA minor is not merely the piecing together of software-focused tools or courses, but - at a higher level - is a more holistic approach to data analysis that provides a structured supplement to accounting curricula or for any business major. The purpose of the paper is not intended to identify a definitive model for business analytics programs, but rather to offer a view of the framework and types of courses that can be expected to be found in such programs.

An emphasis on the need for business analytics (BA) skills has gained momentum over the past decade. Highlighting this point, the accounting area in particular has been under pressure from multiple fronts. AACSB (2013) introduced Standard A7 to their accounting accreditation process in 2013, requiring programs to address data analytics in their curricula. Similarly, pointing to CPA exam content, the AICPA (2021) has been increasingly emphasizing the importance of numerous analytical and technical areas, including descriptive, predictive, and prescriptive analyses, as well as data management, relational database concepts, and ETL (extraction, transformation, and loading) processes.

The above standards and requirements coincide with the evolving landscape of the accounting profession. Industry voices (e.g., PWC, 2015) have long noted the relevance of a wide range of "data-driven" skills, from software tools such as Microsoft Excel and Access, SQL, Tableau, R, and Python, to a host of conceptual and analytical techniques such as statistical inference, regression analysis, data mining, optimization methods, data modeling, relational databases, and data visualization. In turn, accounting employers and businesses in general are expecting students to be more familiar with data analysis software tools (Jadhav, 2023).

On the other side of the equation, accounting scholars have been proposing and investigating how to incorporate analytics tools and techniques into existing courses (e.g., Tschakert et al. 2017, Dzuranin et al. 2018, Qasim et al. 2020, Losi et al. 2022, Salimi 2023). However, one recent study found that while Microsoft Excel and data visualization were the most extensively used applications in accounting courses, many other tools like data mining, querying, SQL, Alteryx, Microsoft Power BI, Python and R have received less attention (Salimi 2022).

Accounting faculty face many challenges incorporating analytics tools into their curriculum. Some of the top concerns include a lack of professors with analytics experience, determining which courses should cover analytics, and a lack of collaboration between departments (Losi et al. 2022). These concerns are exacerbated by weighty curricula and course content, coupled with the fact that analytics skills can be taught using numerous software tools. To this point, even while motivating accounting faculty to teach Alteryx (a software tool that has been gaining favor in the accounting circles), Meyer (2021) cautioned against spending too much time trying to teach software in an already

over-filled schedule. Ultimately, given the resource and curricular limitations, it has been suggested that accounting programs could, in part, rely on existing analytics courses in other departments (Tschakert et al. 2017).

LITERATURE REVIEW

What is "Business Analytics"?
Analytics courses are offered across the many disciplines of business schools, with economics, finance, marketing, and supply chain management scholars among those joining the call for integrating analytics within their courses and curricula (e.g., Akalin, 2017; Liu & Levin, 2018; Wilson et al., 2018; Croushore & Kazemi, 2019). While some in the academic world equate "business analytics" primarily to mean business statistics, or at least see statistics as the primary component (Phelps & Szabat, 2017), others see it as a broader concept that stemmed from within the information systems and decision sciences fields (Klimberg and Miori, 2010).

These positions are not incompatible as business analytics can be best described as a systematic process that utilizes a range of descriptive, predictive, and prescriptive data analysis tools and techniques in support of business decision making (Power et al, 2018). Furthermore, Power et al. (2018) analyzed the plethora of BA definitions and pointed out that the most cited research on "business analytics" (Chen et al., 2012) - which was published in the premier journal *MIS Quarterly* - actually referred to the term as "business intelligence and analytics" (BI&A). Davenport & Harris (2007), the scholars who literally wrote the book on business analytics, viewed BI as a set of technologies and processes that includes both data access/reporting and analytics, ultimately seeing BA as a subset of BI.

While the lengthier term is still used in tracking the BI&A market, the shortened version of BA has emerged as the common usage today. Examining this interrelationship between BI & BA, Klimberg and Miori (2010) summed up its interdisciplinarity by characterizing the techniques within business analytics as originating from multiple disciplines and viewpoints that includes information technology, statistics, and operations research / management science.

Business Analytics Versus Data Science
Just as the terms analytics and statistics might be used interchangeably, so might the terms business analytics and data science. However, both the "business" and "science" qualifiers are significant distinguishing factors. Despite the cross-over between the tools and techniques used in the business analytics and data science fields, multiple research articles provide evidence from job postings on how the focus of each profession differs. For example, analyzing key words used for Business Data Analytics (BDA) and Data Science (DS) jobs, Radovilsky et al. (2018) emphasize the frequently used business-oriented terms in the BDA jobs (e.g., SQL, reports, business, environment) versus the technical/scientific-oriented terms in the DS jobs (e.g., Python, machine learning, big data, algorithms).

Verma et al., 2019) also analyzed postings from the perspective of the tools used in multiple analytics professions and drew similar conclusions. Their study showed that Business Intelligence Analyst and Business Analyst postings emphasized Excel, SAS, R, and SQL, with Excel dominating the tools identified for the analyst postings, while programming did not make the top five skill categories. On the other hand, Data Scientist postings showed a stronger focus on technical skills such as programming, data mining, and big data tools, even concluding that data science positions required substantial programming expertise.

Business Analytics Process/Content
Consistent with the interdisciplinarity previously described, multiple scholars and practitioners have viewed business analytics from a process perspective, identifying knowledge domains that span along a project lifecycle framework (e.g., Wilder & Ozgur, 2015; Zhang et al., 2020). The framework defines a spectrum that includes:
- data management (acquisition and preparation of the data)
- data analysis (descriptive, predictive, and prescriptive analyses)
- data interpretation (visualization and reporting)

Furthermore, Zhang et al. (2020) described a set of tools (namely Microsoft Access, Excel, and Power BI, SQL, R, and Tableau) that could be used to implement a full range of BA processes. Not only were most of these tools aligned with the those listed in the BA job skills studies, but tools like Tableau and Power BI also offer a range of functionality that circles back to the process perspective noted above. This functionality and perspective are further investigated as part of a competitive analysis and environmental scan.

METHOD

While this paper is not intended to test or validate a definitive business analytics curricular model, the research leading to this paper did employ a competitive analysis and exploratory study per se to assess the status of BA programs and the tools and techniques fitting to BA coursework. There were multiple interrelated areas of study, beginning with an examination of BA-relevant tools.

Examining Business Analytics Tools

Gartner - the leading IT research group - ranks the top 20 "Analytics and BI Platform" tools based on several criteria, including data sourcing, preparation, analytics, visualization, and reporting. Not only does Gartner's criteria affirm the range of tasks and knowledge domains in the BI/BA discipline, but their rankings also affirm the user focus of BA tools. Gartner's analysis includes well-known names such as SAS and IBM, with Tableau ranked second only to Power BI, the latter of which is Microsoft's integrated product that is enhanced by a massive market reach due to Microsoft's SQL Server and Office platforms (Brust, 2021). A review of definitions from some of the major software providers in the BA industry can provide even more details into the nature of business analytics (see Exhibit 1).

Exhibit 1. INDUSTRY DEFINITIONS OF BUSINESS ANALYTICS

IBM (https://www.ibm.com/analytics/business-analytics)
> *Business analytics is a set of automated data analysis practices, tools and services that help you understand what is happening in your business and why, to improve decision-making and help you plan for the future.*

Microsoft (https://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/what-are-business-analytics-tools)
> *Business analytics tools are types of application software that retrieve data ... to be reviewed and analyzed. Most organizations use more than one analytics tool, including spreadsheets with statistical functions, statistical software packages, sophisticated data mining tools, and predictive modeling tools.*

Tableau (https://www.tableau.com/learn/articles/business-intelligence/bi-business-analytics)
> *Some common methodologies in business analytics are:*
> *- Data mining: sorting through large amounts of data to identify patterns and trends*
> *- Aggregation: the process of gathering and organizing data prior to analysis*
> *- Forecasting: analyzing historical data estimate future outcomes*
> *- Predictive modeling: extracting information from data sets to identify patterns and estimate future trends*
> *- Data visualization: creating visual representations of data analysis, such as charts, tables, or graphs*

SAS (https://www.sas.com/en_us/software/business-analytics.html)
> *Easy-to-use predictive analytics and smart algorithms enable business users and analysts to assess possible outcomes, collaborate on what's most relevant, and make better, data-driven decisions without programming.*

In addition to emphasizing the process, tools and techniques that enable data-driven business decision-making, the industry definitions also reference: end-users, self-service, easy-to-use, and no programming. In fact, a 2020 Dresner Advisory study reported that 62% of businesses found it essential for the self-service business intelligence (BI) market to provide analytics tools to business users without the need for technical support (Columbus, 2020). Combined with the context of data-driven business decision-making using descriptive, predictive, and prescriptive techniques, the concept of self-service analytics reveals the applied basis of business analytics processes and curricula as opposed to a more mathematical or scientific approach of other data-focused curricula such as that in the data science field.

Examining Curricula - Business Analytics Versus Data Science

U.S. News & World Report's "Best Colleges" lists maintains separate rankings for "business analytics" and "data analytics/science" programs, and offers the following differentiation (U.S. News & World Report, 2022a, 2022b):
> *- Business analytics explores how to use data to help organizations make better decisions*
> *- A data analytics/science specialty prepares students to use computer programming and statistics to scrutinize data for trends and patterns.*

Alan Montgomery, director of the master's program in Business Analytics at Carnegie Mellon University, which is ranked by U.S. News & World Report in the top three in both disciplines, offers this perspective (Tepper School of Business, 2022):

> *If students are interested in the application of data to support business decision-making, then students are better served with a degree in business analytics. If students are more interested in the science underlying the models and data or in broad applications of data science, then I would encourage them to consider a master's in data science.*

To further investigate the BA discipline, 16 AACSB accredited universities were examined with respect to their business analytics and data science programs (see Exhibit 2). Some observations are as follows:

- 10 of the 16 universities offer both a business analytics and data science program, emphasizing the fact that each fulfills a different (but related) purpose.
- 13 of the 16 universities offer an analytics-related major or minor in their business school, with 8 offering a BA major and 12 offering a BA minor.
- 8 of the 13 universities used "Business Analytics" as the name of the major or minor. Other names included Business Analytics & Information Systems, Business Analytics & Intelligence, Business Data Analytics, Data Analytics, and Financial Data Analytics.

Exhibit 2. COMPARING DATA AND ANALYTICS RELATED MAJORS AND MINORS

Type	Setting	Size*	Data Science or Analytics Major	Data Science or Analytics Minor	Business Analytics Major	Business Analytics Minor	Credits Beyond Business Core**
Public	Urban	47,000	Data Analytics		Business Analytics	Business Analytics	15
Public	Urban	29,000			Business Analytics	Business Analytics	12
Public	Suburb.	21,000			Business Analytics	Data Analytics	15
Public	Rural	18,000			Business Analytics	Business Analytics	9
Public	Rural	17,000	Data Sci & Stats	Data Analytics	Business Analytics	Business Analytics	15
Public	Urban	14,000	Data Science	Data Science	Bus Analytics & Intel		
Public	Urban	13,000	Data Science	Data Science		Fin Data Analytics	9
Public	Rural	12,000	Data Science		Bus Data Analytics	Bus Data Analytics	12
Public	Urban	11,000	Data Science				
Public	Urban	9,000		Data Analytics			
Private	Suburb.	9,000		AI & Data Science		Business Analytics	12
Public	Suburb.	7,000	Math w/ Data Sci			Business Analytics	15
Private	Urban	6,000	Data Sci & Analyt	Applied Data Sci			
Private	Urban	5,000	Data Science		Bus Analytics & IS	Business Analytics	15
Private	Suburb.	3,000	Data Science	Data Science		Business Analytics	14
Private	Rural	2,000	Data Analytics	Data Analytics		Business Analytics	18

* *Size refers to the number of undergraduate students (rounded to 1,000) enrolled at the university in Fall 2021.*
** *Credits Beyond Business Core refers to the number of credits required for a BA minor that go beyond the courses in the business core. **Note**: in some cases, the total credits may be more than shown due to prerequisite courses for BA "electives", particularly for students who do not normally take business core courses.*

Examining Curricula - Business Analytics as a Discipline
BA minor programs in particular were analyzed at a more detailed level. While the analysis was driven by curricular development, this paper seeks to address the potential interest in utilizing BA coursework across departments. Not only can BA minor programs offer a viable supplement to most any business major, they also can provide a point of reference in an effort to frame and define business analytics coursework.

A look at the departments offering a BA minor illustrates how programs can cross between interrelated disciplines and how even the departments themselves often are interdisciplinary (see Exhibit 3). Given the addition of the BI&A programs to business colleges, "Analytics" (or "Intelligence") has made its way into most of the department names. At the same time, consistent with the roots of the field, Information Systems and Operations / Supply Chain Management also are found in the majority of the names, with the exception of Economics departments, which accounted for two out of the 11 business schools with BA minors. As a point of comparison, the data science and data analytics minors also are somewhat interdisciplinary, with Statistics, Math, and Computer Science accounting for the majority of departments offering a minor.

Exhibit 3. DEPARTMENTS OFFERING DATA AND ANALYTICS RELATED MINORS

Departments Offering Business Analytics Minor	Depts Offering Data Science/Analytics Minor
Analytics & Information Systems	Computer Science
Business Analytics & Information Systems	Engineering
Business Intelligence	Human Services
Economics …*appeared twice*	Math and Computer Science
Information Systems & Analytics	Math and Statistics …*appeared twice*
Information Systems and Supply Chain Management	Statistics
Information, Operations and Technology Management	Statistics and Computer Science
Management Information Systems, Operations & Supply Chain Management, and Business Analytics	
Operations and Business Analytics	
Operations, Business Analytics, and Information Systems	

Examining Curricula - Business Analytics Course Content
The nature of business analytics as an interdisciplinary field lends itself to courses already offered (and to the use of existing faculty expertise), including courses in the business core. In fact, all of the studied BA minor programs employed business statistics (often called business analytics) in both the business core as well as part of the BA minor (often as a pre-requisite to required courses). Exhibit 4 shows examples of two BA minor programs.

Exhibit 4. EXAMPLES BA MINOR PROGRAMS

	Business Analytics (15 Credits)			Business Analytics (15 Credits)
Required	**ISA - Database Systems** **ISA - Applied Regress'n in Bus** **ISA - BI & Data Visualization**		**Required**	**BAIS - Data Model/Mgmt** **BAIS - Business Analytics** **BAIS - Data Mining**
Select 2	*ISA - Business Programming* *ISA - Quant Analys of Bus Prob* *ISA - Stat & Design of Exper* *ISA - Managing Big Data* *ISA - Business Forecasting* *ISA - Data Mining in Business* *STA - Statistical Program'g* *STA - Adv Data Visualization* *STA - Forecasting Systems*		*Select 2*	*ACCT - Acct Info Sys & Controls* *BAIS - Sabermetrics* *BAIS - Intro to App Developmt* *BAIS - Data Visulaization* *ECON - Macroeconomic Analys* *ECON - Empirical Anlys In Econ* *FINC - Investments* *FINC - Financial Modeling* *MKTG - Marketing Research* *MKTG - Category Management* *MKTG - Consumer Behavior*

The studied BA minor programs shared similar structures. Some observations are as follows:
-   3 of the 12 programs rely solely on courses in disciplines rooted in the BI/BA field (business analytics, information systems, decision sciences, operations management). Conversely, nine programs utilize courses (as either required or elective) from subject areas outside the BI/BA field, with such courses existing as part of other majors,

- 4 of the 12 programs are anchored on areas outside of BI/BA, with required classes primarily in economics, and with the majority of elective courses in the non-BI/BA disciplines. Three of these four programs did not use the traditional "Business Analytics" name, whereas all eight of the other programs that were anchored on BI/BA courses did use the traditional name.
- 5 of the 12 programs were anchored on BI/BA courses. Again, the majority of elective courses were from non-BI/BA courses, reflecting substantive reliance on existing faculty expertise.

Aside from one program designed with only one required course and the need to take five electives, the remaining 11 programs required either one elective (3 programs) or two electives (8 programs). All but one of these programs were designed with four or five total courses. Taking a closer look at the electives and excluding the BA, CS, IS, and STATS areas (which are more directly in the BI/BA area), more than half (59) of the 105 electives are courses in functional areas as follows: 6 Accounting, 14 Economics, 8 Finance, 20 Marketing, and 11 Operations and/or Supply Chain Management. Many of these courses appear to be typical electives in their respective majors – Accounting Information Systems, Economic Forecasting, Financial Modeling, Marketing Research, etc. Such a design may be either practical (i.e., utilizing existing courses) or pedagogical (i.e., utilizing applied courses from specific fields). Either way, a program may allow elective courses as varied as Consumer Behavior and Investments.

Examining Curricula - Business Analytics Framework

On the other hand, the required courses - particularly those in programs that are anchored on BI/BA courses - appear to fall into a more defined framework that follows the BA lifecycle process perspective. The process approach further aids in categorizing courses in a BA program. Exhibit 5 lists all courses required beyond the business core for the programs entitled "Business Analytics" that are anchored on BI/BA coursework (seven of the twelve programs - delineated in the exhibit by banding - are consistent with these criteria).

Exhibit 5. REQUIREMENTS OF BA MINORS ANCHORED ON BA/IS COURSEWORK

Course Title	Spreadsheet	Data Mgmt	Data Viz	Data Mining	Predict Analyt	Frcstg/Optmzn
Business Intelligence and Information Management		X				
Model-Based Decision Making						X
Spreadsheet Analytics	X					
Data Mining and Analysis				X	X	
Database Systems and Data Warehousing		X				
Business Intelligence and Data Visualization			X			
Applied Regression Analysis in Business					X	
Business Analytics	X					
Data Modeling and Management		X				
Data Mining				X	X	
Data Management and Descriptive Analytics	X	X	X			
Application of Predictive Analytics to Business Data				X	X	
Prescriptive Analytics and Optimization						X
Introduction to Business Data	X	X				
Data Visualization for Business			X			
Data Mining for Business				X	X	
Fundamentals of Information Systems						
Advanced Data-Driven Decision Making	X	X				
Business Data Acquisition Using SQL		X				
Introduction to Data Visualization with Tableau			X			
Business Applications of R				X	X	
Business Decision Optimization						X

As shown, the use of three or four BA core courses provides a basis for addressing the knowledge domains that were defined in the BA process perspective; and programs with three or more required courses also show a wide range of

topics along the BA process spectrum. In addition, all of these programs include business statistics/analytics classes as well as other business core classes (such as introductory Excel-based classes).

DISCUSSION

Examining business analytics from several perspectives provides insight into the structure and content of BA course offerings. Focusing on BA minor programs in particular aids in assessing the role and position of such programs as a potential supplement to accounting and other business majors. There are several important points to note about BA coursework.

Business analytics is not just applied data science skills. Business analytics is a multi-disciplinary field that is closely related to the domain of business intelligence, and that is concerned with data analysis as a means of generating business insights. While it is incorporated into numerous business disciplines, it has roots in the statistical, information systems, and management science fields. Business analytics and data science programs serve different (albeit related) purposes, the latter of which is focused less on business insights or applications and more on the programmatic or scientific underpinnings of data analysis. BA programs often are offered by multi-disciplinary decision science departments that house programs such as information systems and operations management, whereas data science/analytics programs tend to reside in math and computer science departments. While math/science-based data science programs are valuable, they generally are not delivered explicitly as a supplement to business education.

Business analytics is not just statistics or isolated techniques. Business analytics represents a comprehensive set of knowledge domains that span along a project life cycle. In most cases, the use of three or four BA minor core courses provides a basis for addressing the knowledge domains within the BA discipline. BA techniques include data acquisition, preparation, analysis (descriptive, predictive, and prescriptive), visualization, and reporting. As such, important coursework can be found (sometimes not so obviously) under titles such as business intelligence, database systems, data visualization, data mining, optimization and forecasting, and other such courses. A key factor to consider is whether a course is just using these types of techniques as an application employed while teaching a functional topic, or if it is primarily focused on (and explicitly teaching) these techniques as the main topic of the course. While an applied approach can be helpful for understanding BA techniques, students also must be taught the fundamentals and workings of the techniques themselves.

In other words, it is important for the coverage of foundational BA material to be focused on the BA domain(s). The BA core courses are meant to directly instruct students on the relevant BA topics rather than merely using the technique while teaching a tangential topic. This does not mean that a BA core course cannot and should not use examples from disciplines (particularly business-related) to teach the knowledge and skills of a BA domain. On the contrary, the inclusion of business-related contexts is important to helping a student become a more informed business analyst. For example, when teaching prescriptive analytics techniques such as optimization, simulation, etc., it is advantageous to employ relevant examples (which may include supply chain or operations-related problems) that are conducive to utilizing prescriptive techniques. Ultimately, a key factor of business analytics (and the BA minor core) is the business context – it focuses on data, tools, problems, and insights that are directly relevant to business users.

Business analytics is not primarily programming intensive, nor entirely software focused. Business analytics should incorporate self-service tools that are accessible to an end-user. As the end-user may need to employ a range of data techniques, business analytics likewise is concerned with a variety of tools representing a range of capabilities. In addition, tools may be used to teach concepts rather than just to teach widely used software. For example, database concepts might be introduced with a widely accessible application like Microsoft Access; but popular tools like SQL, Tableau, and Power BI also would be important to learn as valuable (and widely used) means for assisting with data acquisition and data preparation. The same would be true for learning statistical techniques – while R, SAS, and SPSS may be valuable to learn, business statistics often is introduced with a more accessible application such as Excel (which in and of itself is a valuable and popular tool). Balance is important in ensuring that concepts and fundamentals are taught either alongside or in addition to relevant software.

CONCLUSION

Business analytics differs from data science and is uniquely positioned as a valuable and accessible resource within business schools. Whereas data science programs tend to incorporate more of a programming and scientific

foundation, BA programs focus on using data analysis for business insights, often favoring end-user tools such as Microsoft Excel, SQL, R, Tableau, and Power BI. BA curricula often are designed to cover the range of techniques that span the BA discipline; and BA coursework often are designed to teach the concepts and underlying foundations of analytical techniques (in addition to relevant and valuable software). With BA minor programs primarily requiring only three to five additional courses beyond the business core, and with existing functional courses often used as BA minor electives, BA minor programs offer a ready supplement to accounting and other business majors.

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Fostering Active Learning: The Effects of Using the Socrative App in Undergraduate Advanced Accounting Classes

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ABSTRACT

This research investigates the impacts of using an App-based engagement and interaction approach in in-person teaching undergraduate-level Advanced Accounting classes. We utilized a quasi-experimental design in testing the impacts of using the Socrative App. The results show some improvements in student learning assessment results. Students who used the Socrative App also rated their experience positively in a student satisfaction survey.

Keywords: active learning, the Socrative App, Advanced Accounting, student satisfaction

INTRODUCTION

Teaching and learning in Advanced Accounting courses are different for both the instructor and the student. Accounting, in general, does require a complex skill set. However, Advanced Accounting courses cover more challenging topics, creating a higher demand for cognitive abilities. The topics covered in an Advanced Accounting course are more difficult than other financial accounting courses. As a result, many students struggle to comprehend these areas. Also, students in advanced accounting courses are typically in their junior or senior year of college and taking other three or four-hundred-level courses. These courses are inherently more difficult than lower-level courses. In these years, students are experiencing a more demanding course schedule, making it more challenging to learn, understand, and excel in advanced courses. These difficulties can cause a need for instructors to alter their teaching methods and activities. Instructors may need to spend more time on the topics that students have trouble learning or add in other learning activities to help bridge the gap between knowledge sharing and understanding.

With more strenuous topics and challenges in learning abilities, students are also back from two years of virtual classes and in a face-to-face setting. Although students are back to this modality, they seem unwilling and unable to engage in class. Students have struggled now more than ever and need extra assistance to understand the course material. To help resolve this problem, instructors need to incorporate active learning in the design and development of accounting courses. According to Blankley et al. (2017, p. 103), "Active learning is broadly defined as any educational activity that involves more than passively listening to a lecture. The key element of active learning is the student's engagement in the learning process, including discovering, processing, and applying information. The goals of these activities include not only better retention of information but also the development of students' higher order thinking skills, such as the ability to effectively analyze, synthesize, and evaluate information." Active learning is paramount in a student's ability to take a role in their own learning process, engage in class discussions, and ultimately improve performance. Active learning has many facets, but incorporating an assessment and digital tool can enrich a student's ability to learn and understand Advanced Accounting at a higher capacity.

Socrative is an interactive and easy-to-use student-response system. The program allows instructors to create formative assessment tools through a quiz, space race, exit ticket, or quick questions of multiple choice, true/false, or short answers. Socrative can be found on the web at Socrative.com or downloaded as an App to any smartphone. Since its development in 2010, "Socrative has nearly 3 million users worldwide and is available in 14 languages" (Socrative, 2023). The instructor creates the assessment ahead of time. The instructor then launches a tool for students to access. The students can either download the Socrative Student app or use their webpage and sign in using a student login. Once logged in, the students enter the instructor's room name, and their assignment will appear. According to Pryke (2020), students found Socrative to benefit their learning, to be a fun interactive tool, and to engage class participation. Similarly, Dakka (2015) found that using Socrative as a student-paced assessment method improved student performance and positively impacted the student learning experience.

This study investigates the effects of using the Socrative App in an Advanced Accounting course in the classroom to foster active learning. The following parts of this paper are organized as follows: literature review, research design, results and analysis, and discussions and conclusions.

PREVIOUS RESEARCH

Active Learning: Theories and Benefits

Business education literature contains an important line of research on the meaning, intent, and positive impacts of active learning in a face-to-face classroom setting. Lin et al. (2019) discussed that in active learning, the learner acquires knowledge through their individual self and interactions with peers. Moreover, Mohammad et al. (2020) found that student-centered pedagogy is comparable to learner-centered pedagogy and active learning. The active learning method in a student-centered pedagogy approach moves the focus of instruction from the teacher to the student (Mohammad et al., 2020). In the study by Blankley et al. (2017), the authors recommended, from their findings, that accounting educators should increase active learning in large classes. From a student's perspective, Taplin et al. (2017) found that active learning workshop-style tutorials helped students learn.

Lin et al. (2019) and Wakefield et al. (2018) found that active learning aligned with educational learning theories. Lin et al. (2019) posited that active learning reflected social constructivism theory via three principles: "Active learners are the creators of knowledge, past experiences provide the basis for the learning process, and knowledge is created by social interaction" (Lin et al., 2019, p. 208). Likewise, Wakefield et al. (2018) found that active learning supports constructivist philosophy because the educational experience is shifted toward the learner, with the learner active in their own learning process.

Active learning requires various interactive learning methods and activities. The use of practical work was a frequent topic in the literature reviewed. Practical work emphasizes action and reflection. Getahun and Mersha (2020) posited that necessary accounting skills, knowledge, and behavior are gained through practical work and off-the-job training. Abbott and Palatnik (2018) concluded that instructors should incorporate practical work through real-world problems, business games, and simulations to enhance critical thinking. Additionally, instructors should focus course content on answering the "why" and "how" (Abbott & Palatnik, 2018). Project-based learning was another prominent active learning method examined in the scholarly literature. Blankley et al. (2017) concluded, based on their research on the state of accounting education in business schools, that project-based learning was the most frequent active learning method used for undergraduate accounting courses. Most of these courses applied project-based learning by having students learn by working independently (Blankley et al., 2017).

Problem-based learning represented yet another active learning method. Problem-based learning is an approach where instructors incorporate real-world problems to enhance student learning. Mohammad et al. (2020) observed that student-centered pedagogy embraces a problem-based or problem-oriented learning structure. In addition, in their study of the use of a tablet, Wakefield et al. (2018) found that the tablet offered an important teaching style using problem-based learning. Blankley et al. (2017) determined, through surveys distributed to undergraduate and graduate accounting students, that about 80% of undergraduate accounting courses use problem-solving activities as individual work in the classroom, even though very little class time as a whole is spent reviewing exercises and problems. Finally, Taplin et al. (2017) found that some accounting students liked the format, structure, logic, and rules of problem-based learning.

Some active learning activities provide instant feedback for the student and instructor. Wong and Yang (2017) found that classroom observations and student focus groups revealed that generating instant feedback enhanced students' learning engagement, collaborative knowledge building, and autonomy as active learners. Instant feedback methods allow students to learn actively (Motani & Garg, 2002). Instructors can answer individual student questions immediately and clear up misunderstandings that most of the class has (Motani & Garg, 2002). Similarly, Pai (2010) studied using Clickers in small classrooms. His study showed that using these classroom response systems "can engage students more actively, enhance the learning process, and facilitate higher-level learning" (Pai, 2010, p. 664).

HYPOTHESIS

Based on the literature on active learning, especially on the positive impacts of active learning on student learning outcomes, we propose in the alternative format the following hypothesis.

Hypothesis: Using the Socrative App in face-to-face teaching of the Advanced Accounting class will improve the student learning outcome.

RESEARCH DESIGN

This study employs a quasi-experimental design. The same instructor taught the same Advanced Accounting class in person twice, one in spring 2022 and the other in spring 2023. Students were undergraduate accounting major students who took the course. The instructor used the same syllabus with the assessment schemes in both semesters. The Socrative App was not used in spring 2022, which rendered the spring 2022 section the control group. The spring 2023 section was the experimental group because the Socrative App was used.

Using the Socrative App
The Socrative App provides formative assessment tools for instructors. For the experiment, the instructor created a quiz consisting of five to ten questions for each chapter. The entire course covered seven chapters. The questions were either true/false or multiple choice. The quizzes were taken during the class period after the chapter material was covered in class. The students were asked to get on the Socrative App and log in using the instructor's classroom number at the beginning of the class. The instructor launched the quiz, and the students answered. After each response, the students received instant feedback on whether the answer was correct or incorrect. While the students were completing the quiz, the instructor could see each student's progress and which questions were correct or incorrect. Also, the instructor could see individual student scores and the percentage correct for each question for the entire class. After the quizzes were completed, the instructor reviewed the quiz on the board.

Data Collection
This study is conducted at a medium-sized public university on the East Coast with a student population of approximately 5,000 students. The university focuses on teaching through experiential learning. The racial demographics of the students at the university consist of 28.8% African American, 49.9% White, 5.0% Hispanic, 1.8% Asian, and 4.7% two or more races. The population comprises 23% of students who are first-generation and 33.3% who are Pell Grant recipients. The College of Business at the university is accredited by AACSB. The accounting curriculum is aligned with the AICPA blueprint. The Advanced Accounting class is a 400-level undergraduate class only taken by accounting majors.

This research project is approved by the Internal Review Board of the university. Archival data on student learning assessments and student course evaluations were collected for the spring 2022 and spring 2023 sections. The Socrative App was used in classroom instruction in the spring 2023 section. The Advanced Accounting class had three exams. Exam 1 covered three chapters: the equity method of accounting for investments, consolidation of financial information, and consolidations - subsequent to the date of acquisition. Exam 2 tested two chapters: consolidated financial statements and outside ownership, and consolidated financial statements - intra-entity asset transactions. Exam 3 included content from three chapters: segment and interim reporting, foreign currency transactions and hedging foreign exchange risk, and worldwide accounting diversity and international standards. All three exams had a total score of 100 points.

In addition, a satisfaction survey was conducted in the spring 2023 section near the end of the semester. The satisfaction survey contains eight questions regarding students' usage experience and perceptions. The satisfaction survey was only made available to the experimental group because the control group did not use the Sacrotive App.

Data Analysis
Statistical analysis in this study was conducted with R (Version 4.3.1). Table 1 summarizes the descriptive data. The average age of the students was 23.83. Most students (68.57%) were in the 20 to 22 age group. The average GPA was 3.26. More male students were in the sample than female students. Caucasians represented 68.58% of the total sample.

Table 1: Demographics (N=35)

	Count	Percent
Gender		
Female	12	34.28
Male	23	65.72
Race		
African American	9	25.71
Asian American	2	5.71
Caucasian	24	68.58
Age		
20~22	24	68.57
23~25	7	20.00
= >26	4	11.43
GPA		
=<3.0	9	25.71
3.01~3.50	14	40.00
>3.50	12	34.29

The exam results of the control group and the experimental group are analyzed by the t-test. As reported in Table 2, the experimental group had more average points than the control group in all three exams. In Exam 3, students in the experimental group scored significantly higher than the control group. In Exam 1, the experimental group earned higher scores than the control group at the P-value =.1 level. When the scores of the three exams were summed up as the total score, the experimental group scored significantly higher at the P-value =.05 level. Given the sample size of 35, we also conducted a series of Wilcox nonparametric tests of the experimental and control groups. The results were similar to those of the t-test. The results of Wilcox tests indicate that the experimental group scored significantly higher than the control group in Exam 3. Also, the total score of the experimental group is significantly higher than the control group.

Table 2: T-Tests of Student Assessment Results

	Spring 2022	Spring 2023	t-value
Exam 1	78.94	86.24	-1.78*
Exam 2	81.06	82.53	-0.39
Exam 3	81.50	88.35	-2.28**
Exam Total	241.50	257.12	-2.11**

* indicates significance at the 10% level. ** indicates significance at the 5% level.

The authors surveyed the students in the experiment class to gauge student satisfaction with using the Socrative App. The average response to the eight questions is 4.43, on a Likert-type scale, with 1= Strongly Degree and 5= Strongly Agree. A list of each question's average and standard deviation is presented in Table 3.

Table 3: Student Satisfaction Survey Results

Question	Mean	Standard Deviation
Socrative Pro is easy to use.	4.73	0.59
Socrative Pro helps me stay focused in class.	3.93	0.70
I learned from the instant feedback enabled by Socrative Pro.	4.53	0.64
The instructor should continue to use Socrative Pro in the future.	4.53	0.64
Other accounting courses should adopt Socrative Pro.	4.47	0.64
I did not benefit from using Socrative Pro.*	4.4	0.51
Using Socrative Pro is a good use of class time.	4.47	0.74
I enjoyed using Socrative Pro.	4.4	0.74

*Reversely coded.

DISCUSSION

Results from the study provide evidence to support the research hypothesis. The student learning outcome is significantly improved in the experimental group with the Socrative App than in the control group without the Socrative App. In addition, students are generally satisfied with using the Socrative App in the separate satisfaction survey. The active learning-based approach probably helps students in the Advanced Accounting class from three different perspectives. First, the activities supported by the Socrative App remind students to stay engaged on cognitively challenging topics of the Advanced Accounting class. The interaction between students and the instructor is augmented by the Socrative App, which is an important tool for active learning (Getahun & Mersha, 2020). Second, the Socrative App makes it easy for students to solve problem-based questions in class (Blankley et al., 2017). Third, the instant feedback to each student brought about by the Socrative App is beneficial for student learning, similar to findings made by Wong and Yang (2017).

The satisfaction survey provides additional information to understand students' learning experiences with the Socrative App. Interestingly, students appreciate the easiness of use and the instant feedback of the Socrative App the most. The Socrative App requires the instructor to set up the questions on Socrative beforehand. Students only need to use their devices to answer the questions in class. The convenience for students stems from the instructor's preparatory work. Instant feedback is recognized by the students as a vital feature of the Socrative App. The students rated the effectiveness of the Socrative App in helping them stay focused in class the lowest. One possible reason is that the Socrative App was only used when reviewing a chapter.

CONCLUSIONS

This study reported on the findings of a quasi-experimental study on the effects of using the Socrative App in an Advanced Accounting class. Students in the experimental group performed better in the assessment than in the control group. The improvement is likely due to the benefits of additional active learning induced by the Socrative App. For the Advanced Accounting class, the benefits turn out to be significant. The student satisfaction survey provides additional corroboration of the findings of the main study.

Future studies could be conducted at different institutions to replicate this study. The Socrative App could also be utilized in different higher-level accounting classes to investigate its effectiveness further. Future researchers can also interview students to investigate their user experience and inquire about possible improvements directly.

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Current Events Fact or Fiction: Strategies for Promoting Awareness of Causes and Mitigation of Misinformation on Facebook Among University Students

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ABSTRACT

Recent literature explores the challenge of educating in a digital misinformation age (Parker, 2023). While current events are often used to engage business students in dialog relevant to practice and the business environment, some sources that are highly regarded and widely used by students do not provide reliable information. For example, social media sites like Facebook have been regarded among users as a reliable source of information. However, recent news on the spread of misinformation on social media has exposed these media outlets for being a platform for predators who seek to spread misleading content that helps them to gain unwarranted credibility and name recognition by establishing trusting relationships with users, promoting their own political ideologies, and framing messages in a manner that promotes rapid dissemination (Feng et al, 2022).

Researchers suggest that Facebook communities, especially during the COVID-19 pandemic, have the potential to offer opportunities for participation in cognitive activities that compensate for the lack of social participation (Ebardo et al, 2022). Research also suggests that Facebook is a "fertile environment" for the spread of fake news (Khan et al, 2023). This paper seeks to promote understanding of how misinformation is spread as it relates specifically to business education on Facebook, the causes and mitigation techniques university students and faculty can use to avoid being susceptible to false information.

Keywords: social media, disinformation, misinformation, Facebook, fact-checking, conspiracy theories

INTRODUCTION

Previous literature on misinformation in business education suggests that both faculty and students contribute to the spread of misinformation in the academic environment. Brahm and Jenert (2019) shed light on faculty's role in spreading misstatements about materialism, competition, the economic model as a natural law, and other management theories. While, other research examined STEM and non-STEM students to explore a comparison of the extent to which they have been exposed to misinformation. Findings of such research suggests that although students from both groups have been exposed to misinformation and "faculty perception bias" (based on the way instructors present information) at some time in their academic journey, STEM students experience fewer instances of faculty perception bias than non-STEM disciplines (Corbitt, 2023).

Numerous studies have aimed to identify and examine the causes, detection methods, and actions that could diminish the impact of misinformation on the internet. And, as it relates to the dissemination of misinformation in business education, researchers have investigated the effects of media outlets like the Business Press in disseminating misinformation on capital markets (Kyung and Marquardt, 2018). Other research has explored "dark side information behavior" (DSIB) as it relates to various business industries including Accounting, Retail, and Information Technology (Stone et al, 2019) and the impact of "fake news" on marketing and consumers and supply chain disruptions (Spanaki et al, 2023). DSIB is defined in the literature as "deliberate falsification, sins of omission, sins of commission, and system or process problems" (Stone et al, 2019; Di Domenico et al, 2021). While "fake news" is described as the opposite of genuine news (Dwivedi et al, 2018).

In an effort to promote understanding of the difference between misinformation and disinformation, extant literature on misinformation offers that while it is similar to disinformation in that both refer to fake or inaccurate information, the main distinction between the two terms exists in the intention. Disinformation usually refers to information created that can intentionally deceive, and misinformation is unintentional (Wu et al., 2019). Some types of misinformation include the unintentional and intentional spread of misinformation, urban legends, fake news, unverified information, rumors, crowdturfing, spam, troll, hate speech, and cyberbullying.

With regard to combating against the dissemination of bias and misinformation in non-STEM disciplines, researchers suggest the application of reflective educational approaches that promote acknowledgment of management theory as a social construction rather than an objective truth and interventions like faculty training and development programs to promote enhanced levels of learning effectiveness (Corbitt, 2023). And, generally speaking, when it comes to misinformation mitigation, the categorized detection methods are content-based, context-based, propagation-based, and early detection. Content-based misinformation detection involves detection based on the text, images, and videos it contains. Context-based detection considers the location and time the information is available online. Propagation-based detection evaluates the pattern in which misinformation gets spread. Early detection tries to identify misinformation in its early stages before it becomes viral (Wu et al, 2019).

This research focuses on the social media platform Facebook as a catalyst for the spread of misinformation among business students. It explores the factors that stimulate, promote discovery, and alleviate misinformation on this platform. This study is motivated by several recent "fake-news" occurrences that have impacted business and raised attention and concern about the social, economic and political impacts of misinformation spreading on the internet. These occurrences include substantially impactful reports surrounding the spread of misinformation related to the 2016 presidential election and the COVID virus, treatments, and vaccines.

This conceptual research seeks to educate and train business faculty and students on the causes and mitigation methods that can be applied towards addressing the dissemination of misinformation from Facebook and hopes to contribute to the extant literature on misinformation by providing insight into the following hypothesized statements:

● Users spread misinformation on Facebook using unsophisticated techniques.
● Mitigation techniques are effective in reducing the spread of misinformation among business faculty and students.

PROBLEM STATEMENT

To examine misinformation on Facebook and offer possible solutions, we have proposed the following research questions for this study:

o What are the techniques used to disseminate misinformation on Facebook?
o What are some of the most promising methods business faculty and students can use for mitigation against misinformation?

These research questions are important and relevant because their answers can provide social media platforms users (i.e. business faculty and students) with information that can increase their ability to detect the occurrences and minimize the impacts of misinformation.

FINDINGS

Causes: Misinformation Spreading Techniques Used on Facebook
Previous research engages both researchers and practitioners from the academic and corporate sector to discuss approaches to combating against the spread of misinformation. Based on their observations, they offer that fake-news, misinformation tactics, and extremism have emerged as new threats to the integrity and validity of information on social networks and the internet (Garcia-Pueyo et al, 2021). Also, the lack of regulatory controls placed on firms and investors lack of caution when interpreting information disseminated through media outlets like the Business Press are offered as contributors to the generation of misinformation related to capital markets (Kyung and Marquardt, 2018).And, other research on the spread of fake news in business and management research and practice suggests that the spread of misinformation is a matter of major concern (Aral, 2018; Knight and Tsukas, 2019; Kuem et al, 2017; Kwon, Oh and Kim, 2017; Murphy, 2017), false content presented as news has the potential to be more damaging than deceptive communication (i.e. greenwashing, astroturfing, false advertising and various other types of false messaging) (Allcott and Gentzkow, 2017; Moravec, Minas and Dennis, 2018), and users are emotionally stimulated to spread fake news and likely to do so on social media outlets when anonymity is maintained (Dennis, Galletta, and Webster, 2021). Therefore, it is imperative to delve into the possible factors that push users into falling for misinformation and to explore the possible methods that could help reduce fake news spreading on social media sites and subsequently being disseminated in higher education through discussions on current events.

Zollo and Quattrociocchi (2018) provided quantitative evidence about the potential cognitive determinants behind the issue of misinformation. The extant literature on the spread of misinformation on Facebook and other social media

sites suggests that many factors involve various forms of manipulation. Research has shown that there are several psychological factors that misinformation sowers use to increase distrust and manipulate people; especially, the "six degrees of manipulation: impersonation, conspiracy, emotion, polarization, discrediting, and trolling, which can spread misinformation and disinformation" (Abrams, 2021). And, impersonation is pretending to be someone that one is not. This can happen through using bots who are not real people and exist merely to amplify a message. It can also occur by people embedding themselves within online communities to spread dissent. Therefore, given the various cunning tactics used to manipulate the minds of users, it is increasingly important for both faculty and students to establish an awareness of effective ways to detect and avoid falling victim to such strategies.

Furthermore, conspiracy theories abound on the Internet. Although they have always existed, their spread has been even more prolific due to the advent of the Internet. With Facebook's algorithms sending people ads and suggestions related to their current views and interests, there is even more of an information silo effect, in which each group becomes an echo chamber and people only hear people who already agree with them (Von Behr, 2013). Conspiracy theories last longer in these echo chambers where they exist unchallenged.

Appealing to emotion is a technique that has been used by politicians and advertisers alike for millennia. When one cannot win over an audience with reason, it is common to appeal to emotion. Spreaders of misinformation take advantage of this concept and have taken it to new extremes. They spread some of the vilest, most horrific stories imaginable to sow discord. People are so outraged by the stories that they never stop whether their provided information is accurate or not.

Polarization is deliberately trying to heighten a "*us-versus-them*" mentality. You are either with us or against us. The nuances, grey areas, commonalities, and middle ground get lost in the mix. Never mind the fact that everyone thinks they are the heroes of their own story, and on many issues, there are legitimate concerns on both sides. Sowers of misinformation deliberately spread provocative ideas and stories which try to erase what middle ground may exist. It is hard to believe one has anything in common with people who allegedly stand against everything one believes in. There is more that unites us than divides us though. We go through life with so many shared experiences- a desire to make the world a better place for ourselves/our children/our planet, we all want to love and be loved, etc. While there is a legitimate place in political discourse for hyperbole, when one combines inflammatory statements with misinformation, the statements become especially dangerous.

Discrediting is deliberately undermining the arguments and position of the other side. While this is a technique used to a certain extent in any debate, sowers of misinformation take this even further. Sowers of misinformation undermine the faith of people in previously trusted sources of information such as the mainstream media. The World Health Organization has cited the rising "infodemic" of misinformation as especially dangerous during the pandemic since much of the misinformation out there has been creating mistrust in public health officials, thus preventing people from following life-saving public health precautions (World, 2021).

Trolling is intentionally making inflammatory statements to upset people. Trolls may or may not believe the things they write. Their sole goal is to get a rise out of the person or group that is getting trolled. Their statements are more akin to hate-filled personal attacks rather than legitimate debate. Articles purporting to be news may actually be an attempt to troll the target audience.

After Zollo and Quattrociocchi (2018) analyzed Facebook data for five years for both Italian and U.S contexts, they also measured the users' responses to information consistent with personal narrative, troll contents, and dissenting information. Their findings showed that users are likely to join polarized communities that share a similar story. Users are likely to acquire news that would confirm their beliefs, known as confirmation bias, even if it contains false claims. Users can choose to ignore information that they disagree with (Zollo & Quattrociocchi, 2018).

So much of what people believe rests on trust. Who do people trust? Who do they believe? People cannot have first-hand experience when it comes to most things that happen in the world. Whose version of events do people rely on, and why? Sowers of intentional disinformation seek to undermine the trust we have in each other and choose to exploit the vacuum that exists once people have lost faith in the entities they once believed in. During a study of trust and distrust related to online misinformation, researchers found that users' trust or distrust towards information disseminated on Facebook relied on their perception of how trustworthy and elaborative the information shared was. It also relied on their self-efficacy of misinformation detection and appropriateness of user behavior within the platform (Cheng & Chen, 2020).

Misinformation uses images, titles, and languages which attract the attention of its readers. The success of misinformation is due to its strategically surreal, exaggerated, impressive, emotional, persuasive nature. Some research suggests that conservatives, right-wing people, the elderly, and less educated people are more susceptible to believing and spreading fake news (Baptista & Gradim, 2020). Although some people are said to be more receptive to misinformation, others can also respond to it based on the presence of various stimuli, including the length of exposure, frequency of exposure, the repetitiveness of exposure, targeted nature of exposure, etc. (Bastick, 2021).

Regarding health-related online information and its reliability, health professionals are troubled with the weight of developing and testing appropriate intervention measures to determine the suitable threshold at which to intervene in misinformation dissemination to avoid any negative health consequences (Chou et al., 2018). Research suggests that the "infodemic" is not restricted to specific health crises like COVID-19 but it is a general feature of health information online that should be acknowledged and broadly addressed as a high priority as it relates to the spread of health information (Broniatowski et al, 2022).

According to Khan and Idris (2019), the users' income and level of education, internet skills of information seeking and verification, and attitude towards information verification predict their perceived self-efficacy to detect misinformation on social media. Also, internet experience, internet skills of information seeking, sharing, and verification, attitude towards information verification, and belief in the reliability of information predicted their information sharing on social media without verifying.

In response to widespread concern about the dissemination and impact of misinformation on social media, social media platforms have expressed an intent to take action to reduce the spread of false content. In a study of trends related to false content spreading, researchers conducted a comparative study examining fake news websites and stories on Facebook and Twitter. Their findings indicate that although user interaction with erroneous content increased consistently on both platforms from 2015 to 2016, there has since been a drastic decline on Facebook while Twitter has continued to trend upward. Such a result suggests that Facebook has implemented changes to its platform since the 2016 election to address issues with misinformation (Allcott et al., 2019).

Mitigation Techniques

In a study of university students, Khan et al (2023) offered that university students believe that users should be responsible for identifying and curbing fake news on social media and they suggest web searches should be used to identify fake news. Critical thinking and new media literacies have also been identified as predictors of university students' abilities to detect fake news on social media (Dame Adjin-Tettey, 2022; Orhan, 2023). And, according to other research, incentives may be a means for promoting users sharing habits that are sensitive to and value truth (Ceylan et al, 2023).

Bode and Vraga (2015) state that many posts within Facebook consist of shared post links by users from outside sources. In 2014, Facebook started providing " related stories " displayed underneath a link when users click on it. To confirm whether such a Facebook function providing related links is effective, the authors decided to test it by showing users a post including misinformation. Furthermore, the authors manipulated the related stories by confirming, correcting, or confirming and correcting the misinformation. Based on the test, Bode and Vraga (2015) found out that the misperceptions of users get considerably reduced when related stories rectify a post with misinformation. In a separate study, researchers found that a useful technique against misinformation is preemptive inoculation where people are exposed to an example of misinformation and are then taught to look out for misinformation (Abrams, 2021). Awareness of misinformation as a potential problem was key in both studies to reducing the number of people who succumbed to misinformation. Previous studies suggest that university professors should promote media literacy by applying Potter's theory of media literacy (Potter, 2004; 2018). The theory of media literacy focuses on media content, media knowledge, media effects, and "real world and self" as means to promote people's capability to create information and make better decisions regarding their use and understanding of information.

Geeng et al. (2020) spoke of the few approaches to fight against misinformation on social media sites. The authors mentioned platform moderation, which entails both behavior and content detection and moderation. Facebook and Twitter, for instance, will remove accounts manipulating the platform and displaying inauthentic behavior. The removal of automated bot accounts would reduce manipulation through impersonation. Posts that are flagged manually or detected as spam or "clickbait" get demoted on their feeds (Geeng et al., 2020). Social sites, such as Facebook, also use another approach that engages and supports users to evaluate the content and identify falsehoods or false

information (Geeng et al., 2020). Geeng et al. (2020) mentioned that other solutions are media literacy, education, professional and research fact-checking services, and platforms such as Factcheck, Snopes etc. There are also user interface designs or browser extensions to relate credible information to consumers. Trusted fact-checking sites can be extremely useful in combating discreditation techniques. Other researchers suggest that fact-checks are effective in increasing accuracy (Cotter et al, 2022; Porter and Wood, 2022; Nygren et al, 2021; Tekoniemi, 2022). With regard to higher education, numerous studies recommend digital literacy as a means of fact-checking. It also recommends that faculty need to be trained and integrate practices like the use of digital fact-checking tools (i.e. InVID-WeVerify, Snopes.com, Factcheck.org, twXplorer, etc.) into their teaching (Nygran et al, 2021; Tekoiemi et al, 2022; Pérez-Escolar et al, 2021).

Facebook users can either report a post or users for spreading misinformation including stories which contain objectionable content that may be designed to troll people. Facebook also has an information button appearing as an "i" button which provides details about the source website of the article. Facebook furthermore provides context on why ads are shown and also warns users about a particular related article which also includes a fact-checked one before sharing any information that may not be accurate (Geeng et al., 2020). It is noticeable that even before sharing an unopened news article on Facebook from major news outlets, it will provide a warning message stating whether users would want to open the article before sharing or continue to share it.

Among the different suggested mechanisms and intervention efforts aimed to detect and prevent fake news from spreading on social media, Sharma et al. (2019) mentioned network monitoring. They said that an intervention strategy based on network monitoring requires that information be interrupted from suspected false news sources. Such interception can be done by using computer-aided social media accounts or paid user accounts whose job is to filter received information and block fake news (Sharma et al., 2019). As previously mentioned, Sharma et al. (2019) spoke of another intervention effort known as crowd-sourcing, which involves users reporting or flagging fake news articles. An approach to crowd-sourcing is to ensure that fact-checking of news articles is a priority (Sharma et al., 2019).

Bernal (2018) stated that Facebook's three main elements of the business model: 1) privacy invasion to profile individuals, 2) mass data analysis to profile groups, 3) the algorithmic curating content via the targeting individuals and groups for advertising; they all create the right environment for fake news. Bernal (2018) furthermore mentioned that if the fake news issue is to be addressed, then, something crucial needs to happen. We can either change the way we use social media, which is unlikely to happen, or the other option is to essentially change the structure and business models of social media sites. The latter is unlikely because data analysis, profiling, and targeting drive and maintain Facebook's business model and the other social media companies (Bernal, 2018).

The legal and regulatory solutions to the fake news issue are fact-checking, complaints mechanisms, and the duty for these platforms to check and remove false news (Bernal, 2018). Furthermore, Bernal (2018) stated that some of these solutions present some immediate issues, for instance, locating these creators, although not impossible to solve but not necessarily easy. Another mentioned issue: if one false news creator gets shut down, another one will take over.

Pourghomi et al. (2017) sought to address issues related to the scrutinized newsfeed algorithm of Facebook that contributed to the dissemination of misinformation. They examined Facebook's mitigation strategies in comparison to their proposed "Right-click Authenticate" approach. Their findings suggest that current techniques are too narrow, restrictive, and inefficient. More work is needed to address the spread of misinformation online. Some possible enhancements they propose include sophisticated data analysis techniques and thorough analysis of third-party fact-checkers.

Artificial intelligence has been proposed, in digital marketing, as a possible technique for monitoring and reputation management on social media platforms (Perakakis et al., 2019). Artificial intelligence (AI) can detect fake news on social media sites (e.g., Facebook) and use their algorithms to demote false news articles on their search results and news feeds. Although it can be an attractive solution to misinformation, it is also flawed because it can create misleading material (Bernal, 2018). It appears that artificial intelligence could create false news, thus spreading misinformation (Susarla, 2018). Bernal (2018) further proposed some possible approaches that might impact the spread of fake news. Among some of the possible approaches, Bernal (2018) believes that reducing people's reliance on Facebook for obtaining news might be helpful. He also believes that, for instance, a reduction in dependency on a particular news source, limitations in data sharing, and limitations in data-mining to make profiling and targeting harder could be among the possible approaches to handle fake news spreading. Another potential usage for artificial

intelligence would be to counter polarization and information silos by modifying the algorithm to allow for more diversity of viewpoints shown in people's newsfeeds.

One other technique that could help counter the emotional appeal of misinformation is mindfulness techniques, where people are encouraged to stop and think about if the message makes sense or if the information is trying to get one to act in a particular way (Jenson, 2017). Mindfulness training has shown some promising results in other areas, such as combating phishing attacks, which in many ways are close in form to misinformation campaigns (Jenson, 2017).

CONCLUSION

Based on the findings of this study, the spread of misinformation is more prevalent in non-STEM majors, occurs frequently based on "faculty perception bias" and seems to be mainly facilitated through psychological manipulation, which causes users to adopt false statements as truth. Concerning detection, misinformation often goes unnoticed given that it is accepted as fact, often based on users' naive state and social media platforms failing to promote awareness and detection effectively. These factors can make business students susceptible to misinformation given their naïve state and lack of awareness of detection and mitigation techniques.

However, many alternatives have been proposed, in the literature, to mitigate fake news. Some of these mitigation techniques include the social media outlets ability to link related stories, enable reporting and information tools, network monitoring, legal and regulatory solutions, mindfulness training, and other mitigation strategies. Social media websites could also explore the use of platform moderation, crowd-sourcing, and fact-checking within these sites. These sites could even try, if possible, using artificial intelligence and emphasize the importance of fact-checking by informing users about the impacts that misinformation has not only on an individual but also on society.

And, in higher education, faculty can support the effort to combat against the spread of misinformation by becoming more aware of and promoting media literacy in the higher education curriculum through educating students on relevant theories like the theory of media literacy and exposing them to various research fact-checking services and platforms.

Although these findings offer optimism with regard to addressing the spread of misinformation in higher education. In light of these proposed mitigation techniques, it appears that there is no specific, tailored method that could deter the spread of misinformation. Facebook seems to have implemented some of these solutions, and yet misinformation is still spreading indicating that most of these techniques are flawed in one way or another. Therefore, as suggested in previous studies, the best way to deal with fake news might depend on people (Susarla, 2018).
Some may offer based on these findings, "Who better to lead the way toward uncovering the truth beneath the social media propaganda than academic scholars? While depending on people's awareness, media literacy and knowledge of fact checking techniques may have some drawbacks, it may in fact be a plausible solution to promoting user's ability to refrain from taking news information at face value and evaluate or verify the content, especially if such information was shared multiple or countless times or shared by sources they might think are credible.

Future studies on these solutions should explore the implementation of combined solutions in the business curriculum to evaluate their effectiveness towards reducing faculty perception bias and decreasing the dissemination of misinformation in the business school.

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Using Time Value of Money Calculations to Evaluate Financial Goals: A Simple Case for an Introductory Finance Course

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ABSTRACT

An introductory undergraduate personal finance class frequently includes a discussion of the importance of personal financial goals. Unfortunately, the evaluation of multiple, simultaneous long-term goals can be difficult to simulate in a classroom setting. This paper introduces a case that successfully blends time value of money calculations with a review of personal financial statements to simulate a simple financial plan for a mock client.

Keywords: finance education, financial goals, personal finance, time value of money

INTRODUCTION

The financial planning process begins with the identification of personal financial goals. Goals provide direction for allocating and stewarding resources. They can also help provide the clarity and motivation required for effective stewardship.

Consequently, introductory Personal Finance courses typically begin with a discussion of goals. In a classroom setting, the identification of one or more sample goals can help provide needed context for students. It is much easier to think about key concepts such as the power of compound interest or the value of starting early when they are discussed in light of saving for a Spring Break trip or a new car.

However, illustrating the complexity of working toward multiple goals simultaneously is more difficult. Students may naturally understand the concept of prioritization, but questions still arise. Is it better to pay off a car loan or save for a down payment on a house? How about paying off a student loan versus increasing contributions to a retirement plan? While personal preferences may ultimately dominate real-life decisions, a thorough discussion of financial planning requires the consideration of multiple variables when establishing priorities.

One such variable is the availability of discretionary income. Clearly, financial planning is much easier when excess cash is available. Determining *whether* excess cash is available requires more analysis. More specifically, the evaluation of personal financial statements helps students assess whether sufficient discretionary income is available to fund a financial plan.

Risk tolerance and expected return are additional variables that may influence goal prioritization. Longer-term goals allow for greater risk capacity and higher expected returns; the result is a decrease in the amount of systematic savings required to reach a goal. Conversely, a low tolerance for risk necessitates a higher amount of systematic savings and may therefore require additional work in prioritizing goals.

Connecting risk and return to discretionary income in the prioritization of financial goals is a key outcome in the financial planning process. And it should be in a Personal Finance class too. This paper proposes a one-period case that outlines multiple financial goals and asks the student to perform simple time value of money calculations to assess the risk/return tradeoff relative to available income.

LITERATURE REVIEW

Business schools have relied on case studies since early in the 20th century (Farashahi and Tajeddin, 2018). Case studies have been referred to as teaching in context and defined by Herreid (2007, p. xiv) as "stories with an

educational message". Many different types of cases have been written. Some cases are detailed descriptions of a situation to analyze and other cases simply ask "what would you do in this situation?". Cases are also presented in different ways including, lecture method, discussion methods, small-group methods, individual cases, computer simulation cases and clicker cases. The purpose of a case study is to give students the opportunity to solve real-world problems and make decisions by applying the theoretical knowledge and skills that were taught in class (Ngotgamwong, 2020).

According to Yadav et al. (2007), case studies help students develop critical-thinking skills, connect content from multiple areas, understand concepts better, and stay engaged in class. Case studies are considered active learning and allow students to learn from experience. These experiences give students the opportunity to learn more from examples than from logical development (website Using Case Studies to Teach-BU). Gudmunson, et al (2015) found that personal finance concepts that were taught with active and interactive methods had positive effects. Research has also shown that students learn more, retain information longer, achieve higher grades, report more satisfaction and have a greater likelihood of graduating (Gudmunson, 2015; Hake, 1998; Felder et al., 1998) when taught with case studies as compare to traditional methods such as lectures. Additionally, research has shown that when information is structured to have meaning and relevance to the students, complex concepts are more easily learned (Vihtelic, 1999). Ngotngamwong (2020) found that students prefer short, lesson-related case studies.

One real-world skill that can be taught by a case study is goal-setting. Goal-setting theory was developed in 1990 by Locke and Latham. Their theory includes two cognitive determinants of behavior; values and goals (Lunenburg, 2011). They say that goals are what an individual is consciously trying to achieve and values create the desire to pursue goals. Therefore, goals influence behavior and performance. Setting goals requires some practical guidelines. Specific goals are better than nonspecific, but goals should be challenging and attainable. While, specific goals give individuals a focused target to meet, challenging goals increase an individual's energy, effort level and persistence and attainable goals allow individuals to feel satisfaction once the goal is attained.

Setting financial goals is recommended by the Certified Financial Planners Board. According to DeVaney (1994) using personal financial statements and ratio analysis can help individuals determine if they have met their goals. Financial ratios help individuals objectively measure their finances and determine financial progress. Griffith (1985) also recommended the use of ratios for financial planning with the ratios covering four broad areas: liquidity, debt, inflation protection and net worth. Setting financial goals and then learning how to apply ratio analysis to personal financial statements helps students connect theory to real-world scenarios.

Cooley and Heck (1996), compiled a list of the concepts taught by personal finance instructors and ranked them according to their survey. The study found that the most important topic covered was time value of money. Time value of money isn't an easy concept for students to understand. Therefore, several studies have recommended various methods to use to teach time value of money concepts. McCarty (1995) proposes that students should use the basic equation. Jalber (2002) and Jalber et al. (2004) created a flowchart to break problems down into smaller steps. Rahman (2018) developed a case to help students understand the concept of the time value of money by addressing four real life problems; loan repayments, investments, asset replacements and growth rate of profit.

Personal finance is a class where students are taught about real life problems. Teaching students how to set financial goals, compile personal financial statements and how to compute the time value of money prepares them for the future. According to Gallagher et al., (1998), a case study should be based on realistic situations to allow a student to use theory meaningfully and proactively. The following case study meets those objectives.

PRESENTING THE CASE

The case has been taught in a Personal Finance course at a small private university by multiple instructors for the past several years. The course is technically sophomore-level, although it is taken by students from all classifications and multiple disciplines. Before every exam, a case is used as an in-class exercise to help students review and apply the relevant material. The activity described below is part of the case that precedes an exam on financial goals and the financial planning process, personal financial statements, budgeting, and the time value of money. Case documents and questions are provided in Figures 1-2.

Identify Goals and Analyze Current Financial Position

To begin, the instructor asks class members to read the brief description of the client's situation and answer seven questions. The first two relate to his goals; the next five require some simple analysis. Students review a cash flow statement and personal balance sheet and perform simple calculations. After allowing the class time to answer the questions, the instructor leads a class discussion of the correct answers (Figure 3).

In answering the questions, students see the impact of taxes, the relationship between spending and opportunity cost, and the importance of budgeting. They also consider the role of saving within a budget and calculate a target value for a cash reserve or emergency fund. An instructor may elect to highlight any combination of these elements to mirror specific points of emphasis previously covered in the course.

Evaluate Financial Goals

After discussing the first set of questions, the instructor again allows students time to work on the second set individually or in groups before entering a time of discussion with the full class. The first question addresses credit card repayment; the second identifies annual savings required for a down payment on a home. Questions three through six all relate to planning for retirement. Depending on the length of the class period, it may be necessary to begin the full discussion before all students have answered all questions individually.

An obvious benefit of these questions is additional practice with time value of money calculations in preparation for an exam. However, the deeper objective is to help students better evaluate the connection between goals, discretionary income, and risk and return (as represented through the time value of money).

Two primary takeaways emerge. First, Bill's retirement goal is unrealistic as stated. Based on his annual investment of $2,400, a retirement age of 65, and an 8% annualized return, he will have $621,736 at retirement rather than his goal of $1,400,000 (question 3). A natural next step is to evaluate the other variables used in the calculation. To maintain his goal and intended savings amount, he would need to earn 11% annually (question 4), or save for 50 years (question 5). The only remaining alternative is to adjust the annual saving need to $5,404.23 (or approximately $450.35 per month). The instructor may choose to use questions 3 through 6 to further discuss the importance of setting realistic goals and the impact of expected return on their achievement. Additionally, students can see that a more risk averse investor will need to save more.

Second, and perhaps more importantly, Bill doesn't have enough discretionary income to meet all of his goals. Question one reveals that Bill needs to save $266.55 per month to pay off his credit card. He needs an additional $3,323.29 per year (or roughly $276.94 per month) for a down payment on his house (question 2). Add his retirement goal monthly savings need of $450.34 and he needs a total of $993.83 in monthly savings to achieve his goals. Without additional context, that number is difficult to evaluate. However, from the cash flow statement, students can calculate his monthly discretionary income of $300. The instructor can note the shortfall and initiate a discussion of potential modifications to his goals. Students see the relationship between setting and prioritizing goals, discretionary income, and risk and return as represented by the time value of money.

CONCLUSION

Goals, budgeting, and the compound interest are three staples of a traditional Personal Finance class. However, the proper integration of the three can be difficult to demonstrate. This paper has outlined a case that allows students to review key concepts and gain a deeper understanding of the financial planning process. It requires some prior knowledge of the principle topics, but can be introduced as a review for an exam or stand-alone activity.

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FIGURE 1: Case Instructions, Background, and Questions

Instructions: Bill needs your help with his finances. Use the information provided to analyze his current financial position and offer advice on his financial goals.

Bill Barnes is 25 and single. His current annual salary is $55,500, but he can't seem to figure out where all of his money goes. He is currently renting an apartment for $1,000 per month and would like to buy a house by age 30. He estimates that he will need $18,000 for a down payment and closing costs. Bill admittedly spends too much on clothes and entertainment, as evidenced by a $3,000 balance on his credit card. While he comfortably makes his monthly payments, he would like to pay off the full balance within the next twelve months. Bill would also like to begin making contributions to his company's 401k retirement plan. Ideally, he would like to retire at 65. His preliminary calculations suggest he will need $1,400,000 to do so, and he plans to start investing $200 per month.

Identify Goals and Analyze Current Financial Position:
1. Bill identified three goals. List them. They should be specific, measurable, and realistic.
2. What other goals might Bill consider?
3. What is Bill's current savings rate?
4. Is Bill's savings rate in line with recommended guidelines?
5. Does Bill have a cash reserve/emergency fund? How much is available?
6. How much should Bill have in a cash reserve/emergency fund?
7. If Bill wants to reduce expenses, which categories might he target?

Evaluate Financial Goals:
1. Assume the annual interest rate on Bill's credit card is 12%. To pay off his full credit card balance in a year, how much will need to pay each month?
2. Assume that Bill begins saving for a down payment on a home and can earn 4% annually. How much should he save each year to reach his goal?
3. If Bill invests $2400 per year into his retirement account and earns 8% annually, how much will he have at his desired retirement age of 65?
4. If Bill invests $2400 per year into his retirement account, what annual rate of return must he earn to reach his retirement goal?
5. If Bill invests $2400 per year into his retirement account and earns 8% annually, how many years will it take him to reach his goal?
6. If Bill can earn 8% on his retirement savings each year, how much must he invest annually to reach his goal?

FIGURE 2: Case Supplement-Cash Flow Statement and Balance Sheet

Bill Barnes
Cash Flow Statement
For Year Ended December 31, 20XX

Cash Inflows

Gross Salary	$55,500	
Payroll Withholdings	15,900	
Net Income (Take-home)		$39,600

Cash Outflows

Auto, gas and maintenance	1,800	
Auto, insurance	1,200	
Auto, loan payments	5,400	
Charitable contributions	600	
Clothing	3,600	
Entertainment	3,600	
Gifts	600	
Groceries	3,000	
Personal Care	1,200	
Rent	12,000	
Savings	0	
Utilities (includes cable, cell phone)	3,000	
Total Outflows		36,000

Net Cash Flow (Surplus) | | | $3,600

Bill Barnes
Balance Sheet
December 31, 20XX

<u>**ASSETS**</u>

Liquid Assets

Checking Account	$1,300	
Savings Account	4,400	
Total Liquid Assets		$5,700

Household Assets

Car	25,000	
Furniture and Appliances	10,200	
Electronics	6,000	
Clothing	3,000	
Total Household Assets		$44,200

Investment Assets

Stock Mutual Fund	1,800	
Total Investment Assets		$1,800

Total Assets $51,700

<u>**LIABILITIES AND NET WORTH**</u>

Current Liabilities

Credit Card Balance	$3,000	
Total Current Liabilities		$3,000

Long-Term Liabilities

Car Loan Balance	20,000	
Total Long-Term Liabilities		20,000
Total Liabilities		$23,000

Net Worth   28,700

Total Liabilities and Net Worth $51,700

FIGURE 3: Answers to Section 1 – Identify Goals

1. *Bill identified three goals. List them. They should be specific, measurable, and realistic.*
   Pay off $3,000 in credit card debt in 12 months; Save $18,000 for home purchase in 5 years; Retire at age 65 with $1,400,000. Students often generalize the goal statements. The case provides an opportunity to re-enforce the importance of well-defined goals ("pay off $3,000 in credit card debt in 12 months" vs. "pay off credit card debt").

2. *What other goals might Bill consider?*
   Pay off car loan, reduce expenses, increase emergency fund. This question is subjective, but encourages the student to go beyond a simple answer and think more deeply.

3. *What is Bill's current savings rate?*
   Savings rate =   discretionary income / disposable income = 9.09%. The surplus of $3,600 is divided by take-home pay of $39,600 to arrive at the answer. Instructors may use this question to stress various subtotals of income.

4. *Is Bill's savings rate in line with recommended guidelines?*
   No, just below target of 10%. Various rules of thumb exist, but a minimum target for savings is 10%. The instructor may elect to reference an alternate target based on course content.

5. *Does Bill have a cash reserve/emergency fund? How much is available?*
   Yes, $3,700. Based on his balance sheet, the only accounts that would qualify as liquid assets are his checking and savings accounts.

6. *How much should Bill have in a cash reserve/emergency fund?*
   36,000 / 12 = 3,000 x 3 = 9,000;   36,000 / 12 = 3,000 x 6 = 18,000. As with the savings rate, there are multiple rules of thumb that might be referenced here. The answer provided assumes three to six months of expenses as the standard.

7. *If Bill wants to reduce expenses, which categories might he target?*
   Clothing, entertainment, auto loan. While somewhat subjective, the client has already identified clothing and entertainment as areas where overspending occurs; the auto loan would free up an additional $450 per month to be applied to other goals.

FIGURE 4: Answers to Section 2 - Evaluate Financial Goals

1. *Assume the annual interest rate on Bill's credit card is 12%. To pay off his full credit card balance in a year, how much will need to pay each month?* **$266.55**

2. *Assume that Bill begins saving for a down payment on a home and can earn 4% annually. How much should he save each year to reach his goal?* **$3,323.29**

3. *If Bill invests $2400 per year into his retirement account and earns 8% annually, how much will he have at his desired retirement age of 65?* **$621,736**

4. *If Bill invests $2400 per year into his retirement account, what annual rate of return must he earn to reach his retirement goal?* **11.01%**

5. *If Bill invests $2400 per year into his retirement account and earns 8% annually, how many years will it take him to reach his goal?* **50.21 years**

6. *If Bill can earn 8% on his retirement savings each year, how much must he invest annually to reach his goal?* **$5,404.23**

Egg-tastic Evidence: A Gamified Experiential Learning Activity for Evidence-Based Business Courses

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ABSTRACT

Evidence-based decision-making is increasingly common in higher education business programs and business courses. Despite the increase in evidence-based decision-making courses, limited experiential learning exercises are available and no gamified activities could be located. Experiential learning is associated with increased learning, competency development, equity, achievement, engagement, and satisfaction while traditional pedagogies are argued not to meet the needs of a new generation of students. To fill the notable void of gamified exercises for evidence-based courses, this work introduces an adaptation of the classic egg drop exercise with gamified elements. In the gamified experiential exercise, learners navigate the acquisition of resources in a competitive auction, the construction of an egg delivery device, the test of their assembled devices, and the pitch to secure a lucrative egg delivery contract while applying evidence-based decision-making in each phase.

Keywords: gamification; active learning, decision-making

INTRODUCTION

Evidence-based decision-making (EBDM) courses are increasing in number across universities after the seminal work of Pfeffer and Sutton (2006) proposed an evidence-based movement amongst managers. Indeed, Charlier et al. (2011) documented evidence-based components in 800 courses across 333 MBA programs. These documented courses and other EBDM courses pose a unique challenge for learners as they explore a new decision-making model, question their assumptions, and critically confront broadly accepted industry knowledge (Schoemaker, 2008). This challenge is exacerbated by the limited availability and applicability of active learning and experiential exercises for evidence-based management and no widely available gamified activities. Herein, EBDM is defined as the "conscientious, explicit, and judicious use of the best available evidence from multiple sources" (Barends & Rousseau, 2018, p.2). This definition is derived from the work of Sackett et al. (1996) in the field of medicine and subsequently extended to business by Pfeffer and Sutton (2006).

Active learning and experiential learning are associated with increased student learning (Ditcher, 2001) and competency development (de Justo & Delgado, 2015; Ito & Kawazoe, 2015). Traditional pedagogies are poorly aligned with the current generation of students who are digital natives, and those pedagogies may inhibit engagement, knowledge development and transfer, and overall satisfaction (Hung, 2015; O'Flaherty & Phillips, 2015; Pye et al., 2015). To improve student learning, global institutions such as UNESCO recommend active learning in higher education (Lindblom-Ylänne et al., 2006). In addition, contemporary research provides evidence that active learning narrows achievement gaps for underrepresented students (Theobald et al., 2020; Burke et al., 2020). While active learning is positively associated with improvements for all students, the improvement is amplified for underrepresented students (Theobald et al., 2020). This work addresses the need for active learning activities in evidence-based management and managerial decision-making courses with the introduction of a gamified experiential exercise.

Gamification is one approach that has been advocated to engage and improve learning for the digitally connected student and is defined as the use of game elements in non-game contexts (Hallifax et al., 2019). In a meta-analysis by Sailer & Homner (2020), gamification is associated with higher cognitive, motivational, and behavioral learning outcomes in higher education. To walk the talk, an evidence-based educator should consider the adoption of pedagogies and activities that are supported by evidence to improve student learning. To that end, an adaptation of the classic egg drop exercise was developed and is introduced herein to reinforce the theoretical concepts of EBDM, address misconceptions, consider practical applications, integrate business concepts, and increase student learning outcomes.

In addition to the aforementioned learning objectives, gamification of an EBDM exercise is important to overcome resistance to complex models, increase engagement, and provide a satisfying way to learn. The development and implementation of this exercise emanates from an online discussion board assignment wherein learners were asked to review the evidence for and against EBDM and take a position. To our surprise, a significant proportion of the class indicated they would not use EBDM in their current or future roles. Preliminary evidence indicates learners are more likely to view EBDM favorably and adopt EBDM in their professional decision-making after courses that included the experiential exercise proposed herein, though the empirics are beyond the scope of introducing the exercise.

EGG-TASTIC EXERCISE

Variations of egg drop exercises have a long history in higher education (Sullivan, 2011; Boardman, 2004; Dow et al., 2009; Walters et al., 1997). For the purpose of our EBDM courses, we attempt to develop a scenario that is current and relatable to learners as suggested by Warner (2005). Most recently, a scenario was developed based on the COVID-19 pandemic. We combined the authors' names to create a fictitious character in this work. Drake Shen is quarantined at his farm due to COVID-19. He is soliciting bids for the delivery of fresh eggs each day. Due to fears of COVID-19 transmission, the eggs must be delivered by air and dropped from no lower than 15 feet in the air. Each team is responsible for acquiring resources and using those resources to construct a mechanism to deliver fresh, unbroken eggs every morning from a drop of 15 feet. The exercise is completed in teams of four (±1), though the number of members on a team can be adjusted to instructor preferences and class size, and the team that demonstrates the ability to deliver unbroken eggs will compete for a contract to deliver eggs daily at a price the group establishes for the next two years. We have employed various self-selection and random processes to establish teams, but barring exigencies, a hiring exercise is used early in the term to form teams in our EBDM courses which combines self-selection with selection for skill complementarity. Those established teams work together throughout the course, including on the Egg-tastic Exercise.

Resources are provided with the intent of allowing two or three of six teams to successfully develop a device to deliver an unbroken egg. Our estimation of the necessary resources is not perfect, and the number of successful teams varies across classes. Limited resources are provided to simulate market dynamics, competition, and resource scarcity. Prior to the beginning of class, the resources are arranged and displayed on a table that is visible to all learners. The following sections describe the implementation of each phase of the exercise.

Introduction (15 Minutes)

As an introduction to the class and exercise, the six EBDM (Ask, Acquire, Appraise, Aggregate, Apply, and Assess) steps are discussed, and learners are asked to apply those steps in the experiential egg drop exercise. Though all six EBDM steps are included and discussed, some are more amenable to reinforcement in the exercise. After the discussion of the EBDM steps concludes, the above scenario and charge are provided to learners. The inclusion of the exercise in the course is rationalized with the previously cited benefits associated with experiential exercise. Learners are more likely to value, engage, and fully participate in exercises when they understand the purpose and benefits (Fox, 2011). The introduction provides learners with less than full information related to 1) resource allocation and 2) selection of the winning bid to simulate decisions under the condition of uncertainty and induce learners to seek out additional information or evidence in the Ask step.

Ask (10 Minutes)

The first, arguably the most important, step in EBDM is Asking (Barends et al, 2014). Learners are provided 10 minutes to ask questions, clarify, and more fully define the problem-opportunity. To facilitate learning and simulate real-world decisions, the exercise is designed not to fully define resource allocation and winner selection in the introduction. Learners can observe the available resources displayed on a table in the classroom. In some classes, this has prompted learners to recognize that there will be competition for the most desirable resources and raise questions about how resources will be selected. In other classes, learners have wrongly assumed they will be allowed to choose all the resources they want to develop a delivery mechanism. In both scenarios, there is ample opportunity to reinforce the Ask step and its importance in the debrief. Related to winner selection, learners are informed they will compete

for a contract to deliver eggs, yet the basis of that competition is ambiguous. Ideally, learners will have the foresight to ask how they will compete, yet on many occasions, groups have operated under the assumption that if they deliver an unbroken egg they win which provides another opportunity to reinforce the Ask step in the debrief.

Acquire, Appraise, and Aggregate (20 Minutes)

Learners are provided with 20 minutes to Acquire, Appraise, and Aggregate evidence to develop a successful design to deliver unbroken eggs. The exercise has been completed in a hybrid section of an EBDM course with an online component. Learners bring their laptops to class, and those laptops are used to acquire evidence via the Internet. We weighed instructing class sections that they must consider sources from each of the four categories of evidence (scientific, organization, practitioners, and stakeholders); however, this was not a requirement of the activity given the significant time limitations. We do, however, discuss how approaches, designs, and outcomes may have varied if the four categories of evidence were included in the debriefing of the exercise.

Specifically, this phase of experiential exercise compels learners to consider the available resources provided in the class to deliver an unbroken egg and use the best available evidence to devise a strategy to construct a mechanism. The phase of the activity involves acquiring evidence, appraising that evidence, and aggregating the evidence. The interdependencies of the EBDM steps are also established. In the course sections that did not Ask to clarify resource allocation, the evidence collected may be of little value to groups who did not recognize all available resources would not be available to them. In sections where resource allocation is clarified, learners collect evidence on how to uniquely use resources that do not hold significant face value which results in the resource being undervalued by rival groups.

Apply I: Resource Auction (10-15 Minutes)

The next two phases of the activity, resource allocation and device construction, address the Apply step of the EBDM process. In the event that students do not ask for clarification of resource allocation, we begin this phase with an explanation of how resources will be secured and the available budget. Resources are acquired by groups in a public auction wherein the instructor verbally solicits bids for each resource, and groups verbally place bids. As a public auction, learners are aware of the bids by other groups and the amounts of those bids. Each resource is auctioned individually, and the bidding process commences by soliciting a low price for a specific resource. A low opening price is intended to attract interest and bids. In some cases, an enthusiastic group will intervene by stating the price it is willing to pay, which is then the starting price. Initially, the price is increased in five-dollar increments with each new bid. The price increment is reduced as interest dissipates and groups withdraw from bidding. Each group starts the auction with $100 to buy resources and is allowed to bid as little or as much as it wishes as long as the group is within its budget. A spreadsheet is useful to keep records of the groups that secure the high bid for each resource to ensure that no group exceeds its budget. Any bid that exceeds a team's budget will be excluded from consideration. Moreover, the auction may be the point at which some course sections become aware of shortcomings in previous phases as they are confronted by the realization that they did not sufficiently Ask and may not secure the anticipated resources. On more than one occasion, groups expected to choose and receive all the available desired resources. That faulty assumption is explored in the debrief and the importance of the Ask step augmented. Nonetheless, the exercise continues, and bids are solicited for each resource. The auction generally takes between 10 and 15 minutes.

The auction phase introduces market dynamics to the activity which establishes a foundation for the integration of EBDM and general business concepts. Tensions may flare in competitive classes as groups vie for the same resources. Indeed, competitive rivalry emerges, characterized by groups bidding for resources they do not wish to acquire to decrease the attractiveness of the resource to other groups or buying undervalued resources. In the debriefing, we discuss the notion that decisions are not made in a vacuum and that consideration of the external environment is critical to success. Pursuant to the resource-based view of the firm (Madhani, 2011), a resource can be the basis of a competitive advantage when it is valuable, rare, inimitable, and non-substitutable. The activity brings salience to the dynamics of competition for resources and the importance of novelty and creativity. The intuitive, common decision alternative may result in competitive parity as other firms employ the same or similar alternative (Barney, 1991).

Apply II: Device Construction (15 Minutes)

The next phase of the exercise involves learners applying the evidence they generated to construct a device to deliver unbroken eggs from 15 feet in the air and submitting a sealed bid for the price of their egg deliveries. Groups are allotted 15 minutes to collect their resources, construct the egg delivery device, and submit a sealed bid price for egg delivery. The sealed bid is each group's bid price to Drake Shen to deliver an unbroken egg. Derived from Warner's (2005) iteration of the exercise, a description of the criteria on which the bids will be evaluated is not provided nor is information provided on how the winning bid will be selected. Learners may use the Ask phase to clarify those elements of the activity; however, clarification occurred in roughly half the sections in which the exercise was implemented. Regardless, learners observe the amount other groups spend on resources and which groups successfully drop an unbroken egg. Groups are not privy to the pricing strategies of other groups given groups submit a sealed bid. This approach serves two purposes. Firstly, the importance of the Ask EBDM step is reinforced, and secondly, uncertainty is introduced into the exercise to simulate real-world practice. Decision-making under the condition of uncertainty and management thereof is discussed in the debrief.

Assess I: Device Testing (15 Minutes)

After groups have constructed their devices, the next phase of the exercise includes testing designs to deliver unbroken eggs. The design testing phase of the exercise generally takes 15 minutes which involves walking to and from the stairwell, explaining the drop process, and each group dropping and evaluating their eggs. Initially, we tested the designs outside. Groups were asked to throw the eggs approximately 15 feet in the air as a test of air delivery. This created inequities as some groups tossed eggs higher than 15 feet and other groups tossed eggs lower than 15 feet. As a result, future tests were held in a stairwell where we had measured and marked 15 feet above the ground, and all groups dropped their eggs from an equal height. We covered the stairwell floor to prevent any potential broken eggs on the floor. Groups evaluate the efficacy of their designs as they proceed to drop their eggs, generally with much enthusiasm and excitement, and we note the eggs that survived the drop.

Assess II: Pitch and Selection (15 Minutes)

The next phase of the activity involves returning to the classroom, recognizing the teams with successful designs, and unsealing the previously established bids. This activity is allocated 15 minutes. Teams with intact eggs are asked to make a 90-second pitch to sell their designs and services at the prices they established in the sealed bid. Groups with eggs that did not survive the drop serve as the committee that will award the contract. Each student in those groups has one vote for the winner of the contract. The group with a successful egg delivery device that receives the most votes is awarded the contract to deliver eggs to Drake Shen. The purpose of this approach is two-fold. First, the importance of stakeholders is magnified. Our classes exhibited the most reluctance to consider stakeholder evidence in the EBDM process in our courses. Herein, learners are now confronted with how stakeholders respond to their decisions, thereby highlighting the importance of stakeholders as sources of evidence. Our observed learner reluctance to consider stakeholder evidence is consistent with the EBDM literature. As noted by Turner et al. (2017), cultural, organizational, and decision-maker factors limit the application of stakeholder evidence in decision-making. Second, the broader business environment impacts decisions and the success of the outcome; decisions are not made in a vacuum. Every aspect of the EBDM process has internal and external environmental considerations (Ashill & Jobber, 2014) which may include human, financial, and production resources, competitor capabilities and likely responses, and stakeholder impact.

Assess III: Debrief (30 Minutes)

With the contract awarded, we utilize the remainder of class, which is generally around 30 minutes in a 3-hour class for debriefing and discussion. When the discussion is ongoing, the debriefing resumes at the beginning of the next class. We open the debriefing with an opportunity for learners to comment or ask questions. Next, learners are asked if any additional information would have helped them succeed in the exercise. Learners generally recognize and acknowledge that additional information on resource allocation and winner selection would have altered their approach. We lead the debriefing on Ask with a quote from Einstein (Miller, 1955), "The important thing is not to stop questioning. Curiosity has its own reason for existing." We remind learners that fully defining a problem or

opportunity is of foremost importance and precedes all other EBDM steps. As noted by Barends and Rousseau (2018), "A good start begins with asking questions—lots of them." Next learners are asked how assumptions impacted their decisions in the activity. This leads to a discussion of decision-makers entering decisions with personal assumptions that may be biased and not grounded in credible evidence. We emphasize that evidence is collected to challenge a decision-maker's problem-opportunity assumptions and define the problem-opportunity based on the best available evidence. A problem-opportunity cannot be solved when it is poorly defined, and symptoms are pursued instead of the root cause.

Learners are next asked what evidence most contributed to their success. This question serves as a segue to a discussion on the four categories of EBDM evidence (practitioners, organization, scientific, and stakeholders). While all categories are discussed, the focal point is to clarify the role of stakeholders as evidence. Our observations in teaching the course and discussions with other faculty indicate learners are most resistant to stakeholder evidence as the category captures the feelings, perceptions, and beliefs which are perceived to be softer evidence relative to other categories. The notion of stakeholder relevance is reinforced with discussions of how our decisions harm/benefit stakeholders and their power to influence. Brief commentary on ethical decision-making is introduced to address the distribution of negative and positive consequences in decisions, the impact on society, the impact on personal reputations, and the impact on the firm's reputation. This segment of the discussion concludes by describing how stakeholders harmed and/or those with power to influence can impede the successful implementation of decisions. In this exercise, the winner was not selected by the best design or the lowest price, but rather, by the ability of a group with a successful design to satisfy a stakeholder.

The transition to the next discussion segment begins with a question asking the class what factors are important determinants of success for an EBDM decision. The objective of this question is to stimulate discussion of broader EBDM thinking, guiding learners to consider how outcomes of decision-making extend beyond the room in which the decision is made. One aspect of this discussion is the integration of other business concepts in EBDM. The success of a decision is dependent on the reception of the decision within the firm and the external environment. A lens through which to develop this notion is the resource-based view of the firm. Other relevant concepts and theories to integrate should be identified in accordance with your expertise. One of the authors includes risk management, real options theory, and uncertainty in decision-making in the discussion.

Next, learners are asked which is the most important of the six EBDM steps. This segment of the discussion is intended to develop the interplay and interdependencies of the entire EBDM process. To increase engagement and interest, we find the example and quote by Webber (1998) appropriate. In Webber's consultation with a managing partner of a law firm in San Francisco, the partner reported to Webber that the firm was experiencing a high turnover rate. The partner indicated the turnover increased from 25 to 30 percent to which Webber proceeded to ask how the firm responded. The partner indicated the firm increased its recruiting to account for the higher turnover rate. Webber (1998) responded, "What kind of doctor would you be if your patient was bleeding faster and faster, and your only response was to increase the speed of transfusion." This example is indicative of a scenario in which a decision was implemented to address a symptom of a problem, not the root cause which should be developed in the Ask phase. Similar examples are available to highlight the consequences to the entire EBDM process, including when bad evidence is acquired, when biased evidence escapes appraisal, when good evidence is excluded, when less than best available evidence is aggregated, when poor implementation occurs, and when outcomes are improperly assessed to establish the interplay of the EBDM steps. Questions and commentary are invited through the debrief, and learner-to-learner interactions are encouraged. Table 1 lists the key questions raised in the debrief and the rationale for the questions.

CONCLUSION

The Egg-tastic Evidence Exercise serves to incorporate a learner-focused, gamified active learning exercise into decision-making courses to reinforce core EBDM concepts, overcome resistance to the adoption of EBDM, bolster engagement, improve student learning, increase satisfaction, and have a little fun in the process. In the first iteration of the exercise, we did not include a learner incentive for the exercise. The absence of an extrinsic reward was sub-optimal. Two groups produced designs that delivered unbroken eggs. However, one of those groups was confident in its design and threw the egg a second time to demonstrate the design's efficacy. The second throw resulted in a broken egg. This egg casualty hindered the Pitch and Winner Selection phase as only one group then had an unbroken egg.

After the first iteration that yielded one successful group, an incentive was introduced in all future iterations. Incentives increase learner interest, participation, and motivation to perform well (Kusuma et al., 2018; Tenório et al., 2016; da Rocha Seixas et al., 2016). The specific incentive offered by us is dependent on course needs but generally includes three points for delivering an unbroken egg and an additional three points for the group selected as the winner on the final course project.

Table 1: Key Debriefing Questions

Question	Rationale
1. What information would have helped you succeed in the exercise	Identify incomplete information and impact on problem-opportunity development
2. Under what assumptions did you operate in the exercise?	Develop how personal assumptions influence problem-opportunity definition and decision-making
3. What evidence was most important to your success (or absence thereof) in the exercise?	Develop the four categories of evidence and increase perceived importance of stakeholder evidence
4. What factors are important determinants of success for an EBDM decision?	Integration of other concepts and theories
5. Which EBDM step is most important?	Develop the interplay and interdependencies between the steps

The exercise has only been implemented in evening classes that ranged from 2.5 to 3 hours in duration. For a more traditional 50-minute class, consider completing the activity in three segments: 1) a. Introduction and Overview (15 minutes), b. Ask and Clarify (10 minutes), and c. Acquire, Appraise, and Aggregate (20 minutes) in the first segment, 2) a. Resource Auction (10-15 minutes), b. Design Construction (15 minutes), and c. Design Testing (15 minutes) in the second segment, and 3) a. Pitches and Winner Selection (10 minutes) and b. Debrief (30 minutes) in the third segment. This division corresponds with the time available in 50-minute classes and provides natural breaks by grouping the phases of the exercise around introduction/preparation, implementation, and conclusion. Finally, a significant challenge in administering the exercise is determining the appropriate resources for learners to construct their designs to deliver unbroken eggs. We strive to provide sufficient resources for two to three teams to have successful designs. A sample list of resources is provided in Table 2. The resources available to learners can be adjusted to accommodate more or fewer than six groups.

Table 2. Resource List

Resource	Description of Resource
Plastic bag	Plastic grocery bag received when purchasing groceries
2 Sheets of paper auctioned together	Standard sheets of printer paper
2 Sheets of paper auctioned together	Standard sheets of printer paper
2 Sheets of paper auctioned together	Standard sheets of printer paper
2 Sheets of paper auctioned together	Standard sheets of printer paper
Packing peanuts	2 measured cups of packing peanuts used in shipping
Pencil cap erasers	Pencil cap erasers with quantity of 20
Piece of string	One six-foot piece of string
Box	One small shipping box that is approximately 6x6x6 inches
8 Sheets of tissue paper	Thin Tissue paper that is used to pack gifts
Clear tape with dispenser	One roll of Scotch clear tape with dispenser
Electrical tape	One roll of black electrical tape without dispenser
Bubble wrap	6x6 inches bubble wrap
2 Small bottles auctioned together	2 inches tall with 1.25 inches diameter or similar
Manila envelope	10x13 inches manila envelope without padding

Source: Adapted from Warner (2005)

Overall, the Egg-tastic Exercise has been a success in our courses in reinforcing the tenets of EBDM, overcoming resistance to EBDM adoption, and increasing student learning and engagement with a gamified experiential exercise. Gamification of EBDM course components provides a fun, interactive, engaging learning experience. Extant research suggests that gamification increases course satisfaction and engagement (Hamari et al., 2014; Barata et al., 2013). We

hope to create a learner-centered, fun, and memorable learning environment, and this gamified exercise is one such mechanism to that end. The fundamental objective of any university course is student learning. Traditional pedagogies have been criticized as inadequate for contemporary, digitally native learners (Hung, 2015; O'Flaherty & Phillips, 2015; Pye et al., 2015). Gamification is shown to improve cognitive, motivational, and behavioral learning outcomes (Sailer & Homner, 2020), and importantly, gamification can close achievement gaps for underrepresented students (Theobald et al., 2020; Burke et al., 2020). We observed two categories of positive outcomes in courses where the Egg-tastic Exercise was implemented. The first category relates to student learning. Preliminary evidence, as reported in discussion board posts and class discussions, indicates that learners have a more favorable view of EBDM, are more likely to adopt EBDM in their professions, and better understand EBDM. The second category relates to engagement. Learners expressed gratitude for including a fun, relevant, and insightful exercise to promote learning, and as educators, witnessing enthusiastic participation in the learning process is encouraging, motivating, and fulfilling. Table 3 provides an estimate of the time needed to complete each phase of the experiential exercise.

Table 3. Time Allocation

Activity	Time Allocated
Introduction and Overview	15 minutes
Ask-Question to clarify	10 minutes
Acquire, Appraise, and Aggregate Evidence	20 minutes
Resource Auction	10-15 minutes
Design Construction	15 minutes
Design Testing	15 minutes
Pitches and Winner Selection	10 minutes
Debrief	30 minutes
Total	130 minutes

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Sustainable, Plant-Based Food Supply Chains: A Teaching Resource

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ABSTRACT

A video-based teaching resource on plant-based food supply chains was developed in order to address three aims: (1) produce a mission-driven response to the "Inspirational Paradigm" document developed by a consortium of Jesuit business schools; (2) help target UN Sustainable Development Goals endorsed by the 2020 AACSB business accreditation standards; and (3) introduce basic concepts of sustainability in a management course, while grounding these concepts in a case study that contrasts less sustainable supply chains (meat and dairy) with more sustainable ones (plant-based food). Student responses to the teaching resource were strongly favorable.

Keywords: sustainability, supply chains, plant-based food, Jesuit education

INTRODUCTION

Within the broad landscape of global business education, a specific niche–that of Jesuit colleges and universities–has been working to help shape business programs that are strongly infused with sustainability themes, thus more closely reflecting Jesuit identity and values. This effort has been helped by statements and publications issued by Pope Francis (the first pope to come from the Jesuit order), most famously his encyclical *Laudato Sí: Care for our Common Home* (Francis, 2015), a document whose themes resonate powerfully with the core ideas underlying sustainability.

In 2019, The International Association of Jesuit Universities (IAJU) convened a task force to help "develop a pathway to drive transformation in Jesuit Business Education." Its first step was to create a foundational document for the project, titled "The Inspirational Paradigm for Jesuit Business Education" (IAJU, 2020). Upon the global release of this report, the deans of the twenty-seven business schools that comprise the American Jesuit Colleges and Universities (AJCU) launched a competitive grant challenge to encourage the development of materials that would assist Jesuit business schools in aligning themselves with the Inspirational Paradigm. The following paper describes the creation of a teaching resource that was one of the winning proposals for the grant.

In addition to responding to the "Inspirational Paradigm" document, the teaching resource project also had two other aims: to address UN Sustainable Development Goals mandated by the 2020 AACSB business accreditation standards (AACSB International, 2020); and to introduce basic concepts of sustainability in a management course, while grounding these concepts in a case study that contrasts less sustainable supply chains (meat and dairy) with more sustainable ones (plant-based food).

MOTIVATIONS

A key impetus for this project was to develop a teaching resource that would be driven by the Catholic, Jesuit mission of our institution (Canisius University). The Canisius mission statement declares a commitment to a set of Jesuit values that include "[an] individual and institutional responsibility to work for social justice and transform suffering and injustice in the world" and "[a] deep respect for the natural world, and a commitment to responsible stewardship" (Canisius, 2016).

The university's mission statement resonates with the "Inspirational Paradigm" document, which calls for a renewal of business school curricula by rooting them in "an ethical framework that emphasizes … the centrality of the common good." Economic activity, in this vision, must "[meet] the needs of the poor and the excluded" while simultaneously being "based on environmentally sustainable practices." While neither the mission statement nor the "Inspirational Paradigm" explicitly invokes the People-Planet-Profit (or Triple Bottom Line) model of sustainability, the alignment of both with this model is clear.

Another important motivation for the project was to target the latest (2020) AACSB accreditation standards. The new standards, in comparison to the earlier (2013) standards, place a markedly greater emphasis on "societal impact." Standard 9.1 specifies that a school must demonstrate "positive societal impact through internal and external initiatives and/or activities, consistent with the school's mission, strategies, and expected outcomes" (AACSB International,

2020). The standards document specifically suggests (but stops short of mandating) the use of the UN Sustainable Development Goals to meet this requirement, and even provides a discretionary template for reporting that collects all seventeen goals and the outcomes associated with them. Our project in particular targets two goals: 12 ("Responsible Consumption and Production") and 13 ("Climate Action").

Finally, the teaching resource provides a way to introduce management students to the basic concepts of sustainability while grounding them in the concrete example of a case study that contrasts supply chains with grave sustainability issues (meat and dairy) with examples of relatively sustainable ones (plant-based food).

DESCRIPTION OF THE TEACHING RESOURCE

The resource comprises six modules, each module containing a video and a slide deck. The videos range in length from 6 to 20 minutes. The entire resource is open-access, and can be found at the IgnitEd website, a platform that functions as a shared space for Jesuit business education (Shambu, 2021).

Module #1: Sustainability and the Jesuit Mission
Module #2: COVID-19 and Food Supply Chain Disruptions
Module #3: Why Plant-Based Food?
Module #4: Plant-Based Food Industry and Market
Module #5: Technology and Plant-Based Food
Module #6: Current and Future Challenges for Plant-Based Food

Module #1: Sustainability and the Jesuit Mission
We begin by presenting students with two basic definitions of sustainability. The first is the canonical formulation by the Brundtland Commission: sustainable development as meeting "the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Commission, 1987). We then link this definition to the idea of the "triple bottom line" (Elkington, 1997; Savitz and Weber, 2006), thus getting students ready to view business impacts in terms of three categories: People, Profit and Planet (Miller, 2020). In other words, business practices have social, economic and environmental impacts. The goal of sustainable practices is to achieve a balance of these three impacts with the ultimate, overarching goal of maintaining the long-term well-being of humankind (People), the success of commerce (Profit), and the flourishing of the Earth (Planet).

We then proceed to distinguish between two conceptions of sustainability: "weak" and "strong." Weak sustainability refers to a commitment solely to "business sustainability," to the financial survival of a particular organization. Strong sustainability, on the other hand, goes beyond what are most obviously and solely the organization's own interests to consider the social and environmental impacts of its business decisions–and seriously attempts to mitigate them. These notions of strong and weak sustainability are analogous to–and build upon–earlier conceptions of these two kinds of sustainability (Roome, 2012).

Emphasizing strong sustainability over weak also supports a better alignment with Jesuit values. Fifty years ago, Pedro Arrupe (then Superior General of the Jesuit order), coined the phrase "men for others" as he urged the alumni of Jesuit colleges and universities to join the struggle for justice and defend the needs of those who are most vulnerable (Arrupe, 1973). Today, this phrase has been expanded to make it more inclusive ("women and men for others"), and has become a key idea in the mission statements of Jesuit universities (Canisius, 2016; Georgetown, 2000).

Pope Francis's public letter *Laudato Sí* has a subtitle–"Care for our Common Home"–that speaks directly to sustainability (Francis, 2015). The document calls for a global commitment to care for the natural environment and all people–thus directly invoking the "Planet" and "People" terms of the triple bottom line model. The encyclical also introduces the concept of "integral ecology," which proposes the interconnectedness of the environmental and the social. According to *Laudato Sí*, "Nature cannot be regarded as something separate from ourselves or as a mere setting in which we live … we are not faced with two separate crises, one environmental and the other social, but rather one complex crisis which is both social and environmental." This calls for an integrated approach that addresses both: "A true ecological approach *always* becomes a social approach; it must integrate questions of justice in debates on the environment, so as to hear *both the cry of the earth and the cry of the poor*" (Francis, 2015).

The clear and simultaneous emphasis on both environmental and social impacts of business is echoed by recent findings and recommendations of the UN Intergovernmental Panel on Climate Change (IPCC), a large organization

governed by members from 195 countries, and considered a leading global authority on climate change. The most recent report released by the IPCC unequivocally states that a shift to plant-based diets are necessary to mitigate the effects of climate change (IPCC, 2023). The report also makes clear that a failure to reduce climate change effects would have disproportionately harmful effects on people and societies who live in conditions of poverty.

Taken together, *Laudato Sí* and the IPCC report lay out a compelling case not only for the global diffusion of sustainable practices, but also for a shift from meat and dairy based diets to more plant-based diets. This sets up a strong rationale for students for why a study of plant-based supply chains is valuable and relevant.

Module #2: COVID-19 and Food Supply Chain Disruptions
The pandemic, especially in its first few months, exposed at least three key sustainability issues in the meat industry. First, large numbers of meatpacking workers contracted COVID-19 due primarily to working conditions that placed line workers close together. One study estimated that as of May 2020, approximately 4,200 meatpacking workers at 115 processing plants in the US had been infected (Campuzano et al., 2020). Just a few months later, it was reported that ten times that number (over 4200) workers had contracted the virus and over 200 of them had died (Kindy, 2020).

Second, a sizable number of organizations–including restaurants and schools–closed their doors. This, combined with a severe slowdown of production at meatpacking plants, translated to an oversupply of animals who were then culled by the millions, often under troubling conditions, raising animal welfare concerns (Kevany, 2020). Finally, safety concerns over meat products came to the fore when meatpacking plants scaled back safety protocols in order to increase line speed (Whitehead and Kim, 2022).

Similar sustainability issues came to the fore in the dairy industry. Closures of restaurants and schools resulted in a dramatic demand shift of milk, butter and cheese products from wholesale markets to retail outlets such as supermarkets and grocery stores (Hufstutter, 2020). But the lack of packaging and logistics capacity in the supply chain to handle this massive shift, combined with an acute shortage of truck drivers (due to fear of infections) led to an inability to meet this new, increased retail demand. As grocery store shelves sat empty, the situation was exacerbated by the short shelf life of dairy products, and Dairy Farmers of America asked farmers to begin dumping milk a mere couple of weeks into the pandemic (Hufstutter, 2020). Thus, the double impact of mass waste and unmet demand exposed serious sustainability problems within the dairy industry.

Module #3: Why Plant-Based Food?
There are three key factors that are driving a rising number of consumers away from meat and dairy and towards plant-based food: (1) the environmental impact of the meat and dairy supply chains; (2) consumer health concerns; and (3) a growing call for the humane and ethical treatment of animals.

First, the use of animals for food is associated with a large environmental footprint. A recent study found that the raising of cows, pigs, and other animals for food, along with the production of animal feed, together accounted for 57% of all emissions from food production (Milman, 2021). However, emissions from the cultivation of all plant-based foods were significantly lower, at 29%. The same study estimated that producing a pound of beef generated 70 pounds of greenhouse gases, but the process of producing a pound of wheat emitted a much smaller amount–only 2.5 pounds–of the same gases. Mass deforestation in order to clear land for ranching and grazing has also had serious environmental effects. In fact, it is crucial to note that a significant majority of cropland around the world is used to produce not food for human consumption but feed for livestock.

Second, the long-term consumption of, especially red meat and processed meat, is associated with increased risk of colorectal cancer and stomach cancer in both men and women (AICR, 2017; Cancer Council, 2015). In fact, the World Health Organization's IARC (International Agency for Research on Cancer) has classified processed meat as carcinogenic to humans (Bouvard et al., 2015). Further, not only is meat a source of foodborne infections, there is also the potential of livestock posing pandemic risks in their ability to infect humans (Espinosa et al., 2020). Finally, the pervasive use of antibiotics in meat production–both to kill possible infections and to stimulate growth–raises the threat of inducing antibiotic resistance in humans (Van Boeckel et al., 2015).

Animal agriculture also involves inhumane treatment of animals on a large scale. In 2018, about 80 billion land animals were slaughtered for food (Garmyn, 2021). CAFOs (concentrated animal feeding operations), better known as "factory farms," are the source of most meat consumed in the US today. These are agricultural facilities that keep great numbers of animals confined in small, densely inhabited spaces. Animals such as cows, pigs and chickens that

are raised on factory farms are sentient beings that feel pain, and yet the industrialization of agriculture treats them as objects, as mere inputs of production.

Module #4: Plant-Based Food Industry and Market
In recent years, plant-based foods have shown a dramatic increase in market growth. A report by Allied Market Research predicts a global average annual growth rate of 6.4% for the plant-based food market, which is expected to reach $36 billion in size by 2030 (Bhandalkar, 2022). The drivers of this growth include rising consumer demand, new innovations in plant-based foods (that often replicate more faithfully the characteristics of meat and dairy products), and high rates of capital investment in the industry.

A Bloomberg report on the industry predicted that the plant-based foods market would grow from $30 billion to $160 billion over the course of a decade, from 2020 to 2030, eventually occupying around 8% of the market (Garwood, 2022). The report identifies a major impetus for this growth to be the partnerships being forged by market leaders such as Beyond Meat, Impossible Foods and Oatly with major restaurant chains.

The global restaurant chain Burger King provides a vivid illustration of this phenomenon. In 2019, it became the first chain to add a plant-based burger to its menu (Flink, 2023). It has since multiplied the "Impossible Whopper" options on its menu (Pomranz, 2022); and has pledged to make half of its menu in the United Kingdom meat-free by 2030 in order to lower its fossil fuel footprint (BBC, 2022).

These decisions are supported by demographic shifts in attitudes toward meat-eating. A Gallup poll showed that 23% of Americans report that they eat less meat now than they did in the past (McCarthy & Dekoster, 2020). This shift is even more pronounced in certain demographic categories: women were twice as likely as men to have reduced meat consumption, and the percentage of nonwhite consumers to do so was significantly higher than that of white consumers. 90% of all those who reported lower meat consumption did so for health reasons; after health, environmental concern was the next major reason. If the US market is undergoing a transformation, it is even more so the case of Western European countries such as Germany and the UK. For instance, the per capita consumption of meat has declined by over 12% in Germany in the last decade, and Burger King outlets in the country offer a plant-based version of every single item on the menu (Vegconomist, 2023; Torrella, 2022).

Module #5: Technology and Plant-Based Food
Plant-based food poses two broad categories of technological challenges: the first deals with consumer experience, and the other with special needs relating to information technology for the plant-based food supply chain.

In the first category, a major challenge for plant-based food remains its ability to mimic the "texture, taste, appearance [and] mouthfeel" of meat and dairy products (Cumbers, 2021). For example, firms continue to work on the problem of creating plant-based meat that has a "marbleized" appearance that is reminiscent of and evokes animal meat. This marbleized quality goes beyond appearance, and also has other important implications because it is the result of fats and proteins binding together and achieving an integration that results in better flavor release, taste and texture in both plant-based and animal meats (Cumbers, 2021).

Dairy-free plant-based foods present their own challenges. For instance, plant-based ice cream often lacks the creaminess of dairy-based ice cream, thus spurring experimentation with ingredients such as coconut oil and pea protein to help imbue it with a creamier quality (Neimark, 2017). Another example is the difficulty in replicating the texture of dairy-based cheese–that stretches and melts like it (Cumbers, 2021). The umami flavor–a specific savoriness–associated with cheese has also proved challenging to simulate, although the taste, texture and flavor of plant-based meats and cheeses has advanced significantly over the last decade (De Souza, 2023).

The other broad technological challenge is supply chain traceability, made particularly acute in plant-based foods due to their larger number of ingredients in comparison to animal meat or dairy products. Supply chain traceability holds at least three benefits for plant-based food: the ability to satisfy demands by customers for food production transparency; the ability to address food safety issues when they arise; and an increased likelihood that firms will be able to minimize food waste or loss (McKinsey, 2019).

Module #6: Current and Future Challenges for Plant-Based Food
One of the key obstacles faced by plant-based foods is that the eating of meat is culturally entrenched and has a long, global history. The 4N's theory on why people eat meat (natural, normal, necessary and nice) was formulated after

widely surveying meat consumers, and represents a powerful set of rationales that will make conversion to plant-based foods difficult (Piazza et al., 2015). Additionally, the phenomenon of "neophobia"–the reluctance to eat new or unfamiliar foods–is also widespread, even if it is possible to partially alleviate it through informative and clear labeling practices (Alcorta, 2021).

In addition to the challenges in replicating the appearance, texture, flavor and mouthfeel of meat products, there is concern that meat and dairy products provide certain essential nutritional ingredients such as vitamin B-12. Plant-based food consumers who don't eat meat and dairy will have to consciously ingest vitamin supplements or find fortified foods that satisfy their daily requirements. There is a need for promotional efforts that educate consumers on these potential deficiencies and provide advice on measures of correction.

A strong promotional effort is also needed in another area: to more effectively spread awareness of the environmental impacts of the meat and dairy industries. A large meta-analysis found that the environmental effects of meat production were persuasive for significant numbers of Westerners in adopting meat curtailment strategies, most of these consumers being female and young (Sanchez-Sabate & Sabate, 2019).

Finally, a major challenge appears to be scaling up production to meet demand, while taking into consideration factors such as increasing climate volatility (which will impact energy requirements for production), evolution of consumer preferences (which will call for flexible manufacturing lines) and skilled labor availability due to the frequently novel processing methods for plant-based foods (Moses, 2021).

DISCUSSION

The plant-based foods resource has its origins as one of the winning grant proposals for a competitive grant challenge organized by the deans of the twenty-seven business schools that comprise the American Jesuit Colleges and Universities (AJCU). After the resource was created, it was publicly shared at IgnitEd, a sharing resource space for all instructors at Jesuit colleges and universities.

The resource was also assigned in an undergraduate management course at our university. A survey was administered at the end of the course, to which 23 students responded. The survey asked students if they would recommend the continued use of the videos and slide decks that comprised the resource—and if so, why they believed the resource was beneficial in the course.

Unanimously, all students indicated that they found the use of the resource to be beneficial. Four reasons stood out in the frequency of appearance in the written survey responses.

First, a large number of students remarked that they valued the plethora of "real-life examples" from the meat, dairy and plant-based food industries. They seemed to appreciate the fact that the discussion of food supply chains was fleshed out with specific instances of impacts, especially in the meat and dairy supply chains. Second, several students pointed out that the discussion rendered the concept of sustainability more concrete for them, especially because the social and environmental impacts from meat and dairy were made more visible to them. Third, some students stated that they appreciated our discussions of food industries because they were familiar with them from their everyday lives. Finally, a few students wrote that the discussions made them question their food choices and nudged them to be more critical of what they eat and why. Two students remarked that they had turned to vegetarianism as a result of the class discussions driven by the plant-based foods resource materials.

CONCLUSION

Below is a table summarizing the key topics of discussion in each module of the plant-based foods resource. In the future, it is our aim to expand this model to other industries that have sustainability implications, such as the auto industry.

Table 1: Plant-based foods resource: Modules and key topic coverage.

MODULE	KEY TOPICS
1. Sustainability and the Jesuit Mission	–Definitions of sustainability –"Weak" and "strong" sustainability –Alignment of sustainability with Jesuit values –"Integral ecology" –Pope Francis's encyclical and IPCC (Intergovernmental Panel on Climate Change) both motivate a global shift to plant-based diets
2. COVID-19 and Food Supply Chain Disruptions	–COVID's effects on the meatpacking industry –Mass culling of animals –COVID's impacts upon the dairy industry
3. Why Plant-Based Food?	3 key factors driving the shift to plant-based foods: –Environmental impact of meat and dairy –Consumer health concerns from meat and dairy –Humane and ethical treatment of animals
4. Plant-Based Food Industry and Market	–Growth projections for plant-based food –Burger King, a leader in plant-based fast food –Demographic shifts away from meat and dairy
5. Technology and Plant-Based Food	Two major technological challenges: –Challenges in mimicking meat and dairy products –Supply chain traceability for plant-based foods
6. Current and Future Challenges for Plant-Based Food	–Challenges posed by cultural norms around meat-eating –Meat and dairy products provide essential nutrients –Persuading consumers to curtail meat –Scaling up production to meet demand for plant-based food

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Teaching Quantitative Aspects of Sustainability to Business School Students Using Spreadsheet Optimization

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ABSTRACT

As sustainability issues in business become more pressing, the need for undergraduate students to understand sustainability and its aspects has grown. At the same time, there exists a variety of ways in which sustainability has been approached and taught within undergraduate education. While qualitative approaches have been used in business school courses, this paper takes a quantitative approach using a spreadsheet optimization method to address aspects of sustainability–people, profit and planet–to undergraduate business students. Students involved with this approach indicated an increased appreciation and understanding of the key aspects of sustainability, as well as confidence in using Excel Solver to build and solve an optimization model that incorporates these aspects into a production and logistics network.

Keywords: Sustainability, Excel Solver, Business Education, Linear Programming, 3Ps (Profit, Planet and People), Spreadsheet Optimization

INTRODUCTION

As there is a growing need for undergraduate students to understand sustainability issues within a business context, higher education institutions have studied the best ways to address these issues. In rather general terms, these approaches can be subdivided into qualitative and quantitative approaches.

The purpose of this paper is to offer educators a quantitative way of teaching sustainability within a business context, through integrating the 3Ps of sustainability into a linear programming (LP) model built in Excel. LP is a mathematical technique for finding the optimal solution to a problem with linear constraints and a linear objective function, commonly used in optimization and decision-making. It is used in all types of organizations to solve problems in supply chain management, healthcare, and scheduling, etc. (Winston and Albright, 2019). The value of this approach is that while students are learning the impact of traditional constraints on a system, such as manufacturing capacities, demand fulfillment, the factors of sustainability, such as planet impacts, are also modeled as constraints. In particular, students not only gain the knowledge regarding sustainability issues, but also understand that sustainability factors can be modeled quantitatively in support of production and shipping optimization and decision-making.

This paper is organized in the following manner: first, a brief literature review supports the need for students to understand and apply sustainability within a business setting, along with the manner in which sustainability has been approached within undergraduate business education. Next, a way to teach sustainability to undergraduate business students using spreadsheet optimization is described in detail. Finally, the results of student surveys from before and after the spreadsheet optimization exercise are shared to demonstrate the effectiveness of this particular method.

LITERATURE REVIEW

Sustainability has been generally defined as the need to preserve our future world while supporting our current one (Fakhimi et al., 2016). Within a business context, sustainability has been further defined to incorporate its critical aspects of people, environment, and the ability to generate profit. Commonly used frameworks to discuss these aspects have been the Triple Bottom Line and the 3 Pillars of Sustainability, known as people, profit and planet (Slaper and Hall, 1990; Drake and Spinler, 2013; McCunn et al., 2020).

Within business, there has been a growing need for undergraduate business students' competency in sustainability management practices beyond basics of understanding (Stubbs, 2011; Stough et al., 2018; Emblen-Perry, 2019). As a result, there has been an increased motivation to incorporate sustainability into business education at the higher level,

which has given birth to special approaches such as Education for Sustainability (EfS) (Mingueta, 2011; Michel, 2019; Garcia-Gonzales et al., 2020; Turner, 2022).

Approaches to teaching sustainability within a business context have been qualitative and quantitative (Emblen-Perry, 2019; Winter et al., 2022). As there is considerable impact between means of achieving sustainability and supply chain management, many of the quantitative approaches have come from specifically focused areas of sustainability within Supply Chain and Sustainable Operations Management (SOM) (Kunreuther and Kleindorfer, 1980; Govindan and Cheng, 2015; Tayal, 2020). Quantitative approaches, both inside the specific fields of Sustainability within Supply Chain and SOM, have used gaming and business simulations (Chappin, 2017 ; Gatti et al., 2018), general optimization (Karatas and El-Rayes, 2015), an aggregate mathematical solution within a Sustainable Facility Layout Problem (Tayal et al., 2020), and multiobjective programming and optimization (Chen and Andresen, 2014). At the same time, research has shown that quantitative methods of teaching sustainability within business are not widely used (de lat Torre et al., 2021).

In this regard, this paper offers a quantitative approach to teach sustainability by incorporating the three pillars of sustainability into supply chain decision-making through the use of LP and Excel Solver. Within this paper, we use LP to formulate and solve a production and logistics problem that includes constraints related to sustainability. The main goal of this assignment is to increase the knowledge of the students about sustainability and quantitatively incorporate sustainability measures in a linear programming model about supply chain. Where a typical linear programming problem focuses on capacity, material availability, or demand issues, this problem incorporates constraints related to aspects of sustainability in addition to the typical issues. Additionally, this method provides general business students at the undergraduate level a basic means to grasp and incorporate aspects of sustainability into business decision-making.

INSTRUCTIONS FOR THIS EXERCISE

General Overview
In this section we explain how this assignment was executed within an undergraduate business course on supply chain analytics. Following three sessions of learning how to build optimization models using spreadsheets and Excel Solver, the students were instructed to read the paper, "*The Triple Bottom Line: What Is It and How Does It Work*?" (Slaper and Hall, 2011). Next, the problem described in the following section was explained in the classroom. In addition, students were introduced to a template of the linear programming model built within Excel. A template file has been developed to assist students in approaching the problem, providing them with initial guidance, structure, and a starting point for their work. Following this introduction, the students were expected to complete the model by the next session. In the final section of the exercise, the instructor explained the model's solution to the students.

The Optimization Model
The SustainableSupply Company has four factories in the United States located in the cities, F1, F2, F3, and F4. Each of these factories produces three products - PA, PB, and PC and they serve five customers that are located in cities C1, C2, C3, C4, and C5. The maximum production capacity of each factory in terms of the three products manufactured is provided in Table 1.

Table 1: Facility Capacities Per Product

Facility	Capacity: Product PA	Capacity: Product PB	Capacity: Product PC
F1	200000	220000	300000
F2	160000	195000	320000
F3	220000	200000	350000
F4	180000	190000	330000

The product demand for each customer in the five cities is satisfied by a combination of the production at the four factories. The demand data by product type and customers in each of the five cities are provided in Table 2.

Table 2: Customer Demand

Customer	Demand: Product PA	Demand: Product PB	Demand: Product PC
C1	100000	110000	260000
C2	120000	100000	300000
C3	115000	140000	200000
C4	98000	150000	120000
C5	95000	80000	100000

In the context of this scenario, we assume two cost categories - production costs and transportation cost. The production cost per unit of the different product types in each of the four factories is listed in Table 3.

Table 3: Cost of Producing One Unit of the Product in Dollars

Facility	Product PA	Product PB	Product PC
F1	10	17	30
F2	10	20	30
F3	12	18	33
F4	13	19	31

The distances, in miles, between the customers and the four factories, are provided in Table 4.

Table 4: Distance from Facilities to Customers

Facility	Customer C1	Customer C2	Customer C3	Customer C4	Customer C5
F1	490	480	420	220	490
F2	530	500	430	300	500
F3	500	490	450	330	550
F4	520	510	490	230	620

The transportation cost to move one unit of product PA, PB, or PC over a distance of 100 miles is $2.40. Given the *SustainableSupply Company*'s emphasis on sustainable initiatives, they monitor their two main sources of emissions of Greenhouse Gas (GHG) - production and transportation activities. More specifically they monitor the carbon dioxide, fluorinated gases, and nitrous oxide released from the burning of fossil fuels used for manufacturing of products in the four facilities and the transportation of those products from the facilities to the various customers in the five cities. Every metric ton of GHG released into the environment from our operations is equivalent to one carbon credit. Table 5 shows the amount of carbon credit used in the production of one unit of product at each facility.

Table 5: Carbon Credits per Unit of Production

Facility	Product PA	Product PB	Product PC
F1	210	300	390
F2	40	50	60
F3	50	50	60
F4	10	20	20

Products manufactured by the four factories are transported by trucks to the customer in each of the five cities. The capacity of the trucks used by the *SustainableSupply Company* to ship products from each facility to the customer is 100 units/vehicle. The GHG emitted by 100 miles traveled by these trucks is equivalent to 200 carbon credits. The government-issued carbon credit capacity limit for the *SustainableSupply Company* is 105 million carbon credits. Carbon credit usage beyond this limit will be heavily taxed; therefore, the company would like to stay at or below the above limit.

The sales price of products PA, PB, and PC are 100, 120, and 90 dollars per unit, respectively. The company must fully satisfy the demand of these customers. Its goal is to maximize the overall profit of operations while satisfying

the sustainability requirements (i.e. the maximum limit for carbon footprint). The students were asked to build an optimization model and find the optimal production and shipping plan that maximizes the profit of the company.

Appendix A shows the amounts of products shipped from each factory to every customer. The results suggest that in the optimal solution, facility F1 should not produce any products. Appendix B illustrates the carbon credits produced by this company to satisfy the demand of the customers. The overall carbon credit produced is equal to the maximum carbon credit allowed. Appendix C shows the financial outputs of the problem. In Appendix D a picture of the Excel Solver parameters for this problem is presented.

MEASUREMENTS OF EFFECTIVENESS

Method
To assess the effectiveness of this exercise on the students' understanding of how sustainability factors impact business performance, namely production and logistics network issues, pre and post-test surveys were designed. A 5-point Likert scale was used to ascertain student responses, where 1=No knowledge, 2=limited knowledge, 3=Fair knowledge, 4=Proficient knowledge, and 5=Expert Knowledge. The pre-test survey was designed to get a baseline understanding of student knowledge on sustainability factors and usage of linear optimization (for details refer to appendix E). This pre-test survey was administered to the students, prior to reading the paper, "*The Triple Bottom Line: What Is It and How Does It Work*?" (Slaper and Hall, 2011) and receiving the directions for the linear programming model related to sustainability factors using production and logistics network constraints.

The post-test survey (for details refer to appendix F) was given to students after they read the paper provided earlier and upon completion of the LP exercise in Excel Solver. Student anonymity was maintained during the data collection and analysis process by requiring students to use pseudo-identifiers, which only they recognized. The same pseudo-identifier was used for both the pre-test and post-test surveys to conduct paired difference tests.

Summary of the Results
The data collected from the pre-test and post-test survey was analyzed using a paired t-test for the mean difference approach. The mean difference, $\overline{D}$, between the individuals pre-test and post-test responses for each question was computed as the difference in the Likert scores, as shown below:

$$\overline{D} = \sum_{i=1}^{n}(X2i - X1i)$$

where,

X_{2i} = Response for post-test from individual i (where i = 1, ..., n)

X_{1i} = Response for pre-test from individual i (where i = 1, …, n)

All paired mean differences between the post-test and pre-test question were positive and statistically significant. This indicates that students improved their knowledge on the three pillars of sustainability and LP optimization method using Excel Solver. These results are depicted in Table 6.

Table 6: Results of the Paired Mean Differences (Sample Size (n)=12)

Question Statements related to, Pre-test and Post-test understanding of …	Mean Difference	SD	Significance (Confidence Interval)
… carbon footprint and greenhouse gas emissions	1.10	1.40	0.00* (0.21 - 1.99)
… Energy and water conservation practices	1.11	1.34	0.00* (0.25 - 1.96)
… Waste reduction and recycling initiatives	1.09	1.62	0.00* (0.06 - 2.12)
… Using linear optimization skills to minimize environmental impact	2.17	1.21	0.00* (1.40 - 2.94)
… Using linear optimization skills to ensure economic growth (i.e cost min.)	1.73	1.38	0.00* (0.86 - 2.61)
… Using linear optimization skills to address issues related to people	1.58	1.04	0.00* (0.92 - 2.24)
… Role of sustainability in ensuring long-term economic viability	1.33	1.43	0.00* (0.42 - 2.24)
… Discussions involving how local communities, employees, and other stakeholders are impacted by sustainability decisions	1.42	0.86	0.00* (0.87 - 1.96)

* Values are significant at 95% level of confidence

The two additional questions in the pre-test survey (refer to Appendix E) measured in terms of a 5-point Likert scale, (e.g., where 1=No knowledge, 2=limited knowledge, 3=Fair knowledge, 4=Proficient knowledge, and 5=Expert Knowledge) provided a baseline measure of how the undergraduate students in this study felt about their knowledge on factors related to sustainability and their ability to use spreadsheet optimization as an analytical tool that incorporate sustainability aspects into a production and logistics network decision making process. As shown in Table 7, the results indicate that students in this study had a low level of understanding of sustainability and the application of linear optimization.

Table 7: Results of the additional pre-test questions

Pre-test Questions **(Sample Size (n)=12)**	Mean	SD
Rate your knowledge of sustainability in the context of business operations	2.00	0.82
Rate your knowledge of using linear optimization as an analytical technique to help with decision making	1.83	0.69

The results from the three additional questions in the post-test survey (refer to Appendix F) measured in terms of a 5-point Likert scale (e.g., where 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5=Strongly agree), clearly indicate a high level of student agreement in recognizing, the need, one's own comfort level in proposing, and one's confidence is applying spreadsheet optimization as an analytical tool, to make decisions related to production and logistics network decision within the context of sustainability.

Table 8: Results of the additional post-test questions

Post-test Questions (Sample Size (n)=12)	Mean	SD
This exercise demonstrated the need for using optimization techniques in sustainability discussions and evaluating its impact on business performance	4.17	0.90
I feel comfortable proposing optimization techniques as a tool for evaluating sustainability initiatives in a business context	3.54	0.95
I feel comfortable using (applying) optimization techniques as a tool for evaluating sustainability initiatives in a business context	3.63	1.02

CONCLUSION

The spreadsheet optimization method outlined in this paper not only fostered a deeper understanding of sustainability among undergraduate business students but also enhanced their grasp of its quantitative facets. It guided them in formulating production and logistics problems with a keen consideration for sustainability-related constraints. The results from the pre-test and post-test survey questions clearly indicate that the presented pedagogy used to teach the concept of sustainability quantitatively using a journal article and foundations of LP technique was effective. Students involved with this approach indicated a significant increased appreciation and understanding of the key aspects of sustainability. Their confidence in proposing and using Excel Solver to build and solve an optimization model that incorporates sustainability aspects into a production and logistics network also showed a remarkable increase. In future research, we will explore alternative quantitative methods, such as nonlinear programming and simulation modeling, to further assess the effectiveness of teaching sustainability and its various facets.

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APPENDIX A: UNITS OF THE PRODUCTS SHIPPED FROM EACH FACILITY TO CUSTOMERS

Units of Product PA shipped from facilities to customers:

Facility	Customer C1	Customer C2	Customer C3	Customer C4	Customer C5	Total Product PA Shipped from Facilities
F1	0	0	0	0	0	0
F2	0	0	0	0	95000	160000
F3	22530.3	12000	65000	0	95000	192530.303
F4	77469.7	0	0	98000	0	175469.697

Units of Product PB shipped from facilities to customers:

Facility	Customer C1	Customer C2	Customer C3	Customer C4	Customer C5	Total Product PC Shipped from Facilities
F1	0	0	0	0	0	0
F2	0	0	110000	0	80000	190000
F3	110000	60000	30000	0	0	200000
F4	0	40000	0	150000	0	190000

Units of Product PC shipped from facilities to customers:

Facility	Customer C1	Customer C2	Customer C3	Customer C4	Customer C5	Total Product PC Shipped from Facilities
F1	0	0	0	0	0	0
F2	0	20000	200000	0	100000	320000
F3	50000	280000	0	0	0	330000
F4	210000	0	0	120000	0	330000

APPENDIX B: CARBON PRODUCED

Grams of Carbon Produced in Production	86681212.1
Grams of Carbon Produced in Transportation	18318787.9
Overall Grams of Carbon Produced	105000000

APPENDIX C: COST, REVENUE AND PROFIT OF THE OPTIMIZATION MODEL

Production Cost	$47,921,469.70
Shipping Cost	$21,982,545
Revenue	$210,600,000
Profit	$140,695,985

APPENDIX D: THE OBJECTIVE, DECISION VARIABLES AND CONSTRAINTS OF THE PROBLEM IN EXCEL SOLVER

Solver Parameters ✕

Set Objective: Profit

To: ⦿ Max ○ Min ○ Value Of: 0

By Changing Variable Cells:
Shipment_plan_product_PA,Shipment_plan_product_PB,Shipment_plan_product_PC

Subject to the Constraints:

Overall_carbon_produced__in_grams <= Maximum_carbon_allowed__in_grams
Total_PA_Shipped_to_the_customer = Demand_for_PA_for_each_customer
Total_PA_shipped_from_facilities <= Capacity_for_Product_PA
Total_PB_Shipped_to_the_customer = Demand_for_PB_for_each_customer
Total_PB_shipped_from_facilities <= Capacity_for_Product_PB
Total_PC_Shipped_to_the_customer = Demand_for_PC_for_each_customer
Total_PC_shipped_from_facilities <= Capacity_for_Product_PC

Add

Change

Delete

Reset All

Load/Save

☑ Make Unconstrained Variables Non-Negative

Select a Solving Method: Simplex LP

Options

Solving Method

Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

Help | Solve | Close

APPENDIX E: Pre-test survey

Answer the questions provided below on a scale of 1 to 5.

1. No knowledge: Completely unaware of the topic
2. Limited Knowledge: Familiar with some basic concepts but lack analytical skills
3. Fair knowledge: Have acquired analytical skills to evaluate basic concepts, but there are still significant knowledge gaps
4. Proficient knowledge: Possess a good understanding of using analytical skills to evaluate higher level concepts, but not an expert
5. Expert knowledge: Demonstrate a comprehensive and profound understanding of using analytical skills to evaluate higher-level concepts

Rate your current knowledge of sustainability in the context of business operations.

1   2   3   4   5

Rate your current knowledge of using linear optimization as an analytical technique to help with decision-making.

1   2   3   4   5

Rate your current knowledge of discussions in business about…?

- Carbon footprint & greenhouse gas emissions: 1   2   3   4   5
- Energy and water conservation practices: 1   2   3   4   5
- Waste reduction and recycling initiatives: 1   2   3   4   5

Rate your current knowledge of using linear optimization skills to minimize environmental impact for a given business scenario.

1   2   3   4   5

Rate your current knowledge of the role of sustainability in ensuring long-term economic viability for business operations.

1   2   3   4   5

Rate your current knowledge of using linear optimization to ensure economic growth (profit max. or cost min.) for a given business scenario.

1   2   3   4   5

Rate your current knowledge of discussions involving how local communities, employees, and other stakeholders are impacted by sustainability decisions.

1   2   3   4   5

Rate your current knowledge of using linear optimization to address issues related to people in a given business scenario.

1   2   3   4   5

APPENDIX F: Post-test survey

Answer the questions provided below on a scale of 1 to 5.

1. No knowledge: Completely unaware of the topic
2. Limited Knowledge: Familiar with some basic concepts but lack analytical skills
3. Fair knowledge: Have acquired analytical skills to evaluate basic concepts, but there are still significant knowledge gaps
4. Proficient knowledge: Possess a good understanding of using analytical skills to evaluate higher level concepts, but not an expert
5. Expert knowledge: Demonstrate a comprehensive and profound understanding of using analytical skills to evaluate higher-level concepts

Given your experience with the Linear Programming (LP) class activity, how would you rate your knowledge of the following discussions in business…?

- Carbon footprint & greenhouse gas emissions: 1   2   3   4   5
- Energy and water conservation practices: 1   2   3   4   5
- Waste reduction and recycling initiatives: 1   2   3   4   5

Given your experience with the LP class activity, rate your knowledge of using linear optimization skills to minimize environmental impact on business operations.   1   2   3   4   5

Given your experience with the LP class activity, rate your current knowledge of the role of sustainability in ensuring long-term economic viability for business operations.   1   2   3   4   5

Given your experience with the LP class activity, rate your knowledge of using linear optimization to ensure economic growth (profit max. or cost min.) for business scenario.   1   2   3   4   5

Given your experience with the LP class activity, rate your current knowledge of discussions involving how local communities, employees, and other stakeholders are impacted by sustainability decisions.

     1   2   3   4   5

Given your experience with the LP class activity, rate your knowledge of using linear optimization to address issues related to people in a given business scenario.   1   2   3   4   5

Answer the statements provided below on a scale of 1 to 5.

1. Strongly Disagree: Completely disagree with the statement
2. Disagree: Have some reservations, and disagree with the statement
3. Neutral: Neither in agreement or disagreement. Just undecided
4. Agree: Agree with the statement
5. Strongly Agree: Wholeheartedly agree and strongly support the statement

This exercise demonstrated the need for using linear optimization in sustainability discussions and evaluating its impact on business performance.   1   2   3   4   5

I feel comfortable proposing linear optimization techniques as a tool for evaluating sustainability initiatives in a business context.   1   2   3   4   5

I feel comfortable using (applying) linear optimization techniques as a tool for evaluating sustainability initiatives in a business context.   1   2   3   4   5

Using Classic Films as Laboratories for Evaluating Ethical Dilemmas Beyond the Classroom: Take Two on 'Lights, Camera, Action!'

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ABSTRACT

Assigning appropriate films for undergraduate business ethics students to watch and report can help students find conflicts of interest and ethical dilemmas in different environments.

Keywords: business ethics, film, dilemmas, conflicts of authority, copyright law, mission-appropriate, active learning

INTRODUCTION

Responsibility for ethical lapses in business has been the subject of significant debate in higher education for decades. Simerson & Neal (1993, p 77) cited many studies indicating "a growing sentiment that educators and managers alike" were failing "to address ethical issues in the classroom and in the workplace." According to Martens & Day (1999, p 167) one of the more common mistakes of ethics programs is "designing education programs which are little more than lectures" since "typically, participants will recall less than 15 percent of lecture content." This was seconded by Ferrell, Fraedrich, & Ferrell in their popular business ethics text (2013, p 232)

Incorporating ethical analysis throughout the curriculum, as advocated by Vendemia & Kos (2013, p 96) may have a significant advantage for teaching graduate or nontraditional students who have had some prior work experience. However, undergraduate business students, particularly traditional, college-age, students may be assumed to have insufficient life experience to evaluate ethical dilemmas they will face after graduation in unfamiliar surroundings. Presumably, more experiential learning would benefit such students. A standalone course may have a significant advantage for undergraduates in that it can afford more time for exercises and activities designed to engage the student in a deeper way than lectures alone does have a significant advantage in that it can afford more time for exercises and activities designed to engage the student in a deeper way than lectures alone.

POOR METHODS AND PREPARATION

In a seminal paper, Mintzberg & Gosling (2002) advocated eliminating artificial instructional and experiential "borders" in management education. These borders can include geographical, cultural, and time boundaries (p 64). In the same spirit, Jones & Ottaway (2001) cited earlier studies for "enhancing relevance" of instructional techniques, including student journaling, field visits to corporations, and other activities. Weiss, Lazarony, Halcoussis, & Stone (2018, pp 137-138) advocated the use of vignettes in teaching business ethics but noted that they suffer from "the limitation that vignettes are simplified snapshots of complex dilemmas in the real world." For added realism, Pearce & Jackson (2005) noted the effectiveness of "role-playing" as a technique for active learning in marketing ethics courses through "learning through drama." Specifically, having students compose and act-out "creative drama" to put colleagues in the "hot seat" highlight the role of *context* in ethical dilemmas may be of value. They cited the experiential learning model of David Kolb

> as a cycle comprising four stages: concrete experience, observation and reflection, formation of abstract conceptions and generalizations, and testing of implications (p 200).

Draus, Curran, & Trempus (2014) studied the effectiveness of instructor-generated video on learning business ethics, as did Banerjee, Wolf, Chalsani, Dhumal, & Lee (2020, pp 192-196), but these studies were primarily relegated to the realm of supplementing lectures rather than representing real-life situations. Much earlier, Giacalone & Jurkiewicz (2001) had advocated using movies to "deepen the students' understanding of complex ethical issues (p 79). Specifically, some of the benefits they described were "allowing students to focus on something they enjoy," recognizing issues "within a systemic context," making "ethics realistic in a way cases cannot," and demonstrating the interconnectedness and interdependence of "decisions, decision-makers, and events" (pp 80-81).

Orms (2016, p 53) recommended that students review the documentary film about Enron, *The Smartest Guys in the Room.* Documentaries depict unfamiliar settings, which can serve students well so long as they contain few distractions. Hartman (2009) warned that using pattern recognition to recognize dilemmas is necessary but not sufficient for using materials such as films. There is no such thing as a pure play between ethical situations or even business units (pp 16-17).

WHY USE FILMS IN TEACHING BUSINESS ETHICS?

Giacalone & Jurkiewicz's seminal paper advanced the educational benefits of the movie exercise:
- Allows students to focus on something they enjoy
- Demonstrates how ethical decisions, decision-makers, and events are interconnected and interdependent
- Helps students to recognize that ethical issues are within a systemic context, not discrete results
- Makes ethics realistic in a way cases cannot

Here, Giacalone & Jurkiewicz cannot be improved upon. To quote them directly:

> Although written cases are invaluable in creating dimensionality through data and facts, they cannot provide the richness of experience found in movies. The depth of feelings, the complexity of relationships, and the pathos of human limitations can be closely approximated via movies, as can the liberating sense of self found in ethical responsibility. Movies engage a variety of senses in their learning experience that cannot be replicated elsewhere. The staging, sound effects, dialogue, and characterizations draw students into the reality of decisions in a more vivid way (p 81).

Other benefits not considered here:
- Helps them to develop critical and creative language skills
- Helps students see the connection between scholarship and ethical decision-making
- Provides students with practice in exploring decision-making alternatives and understanding the obstacles to ethical decision-making

SUGGESTED CRITERIA FOR ACCEPTABLE FILMS

Each film should be one which *most students have not seen before*. This can help to clear pre-conceived conceptions about the value of the film for demonstrating ethical dilemmas. Building on the work of McVea and Freeman (2005), unfamiliar surroundings can help to implement a stakeholder-centered approach known as "Names and Faces." Given that "boundaries between stakeholder groups are becoming blurred, and stakeholder relationships are becoming more complex" (p 63), best practice would advise that students be placed in a variety of situations both inside and outside of business settings (*generic stakeholder analysis*). This helps to avoid what Freeman (1988) called the "separation thesis:" the idea that business ethics is separate from other applications of ethics (p 412).

Many films have settings in which conflicts of interest and self-dealing are apparent. Carson (2004, p 161) mentioned "the pervasiveness of conflicts of interest in professional life and the centrality and importance of moral questions about conflicts of interest in professional ethics." Dusksa (2014, p 121) advocated using the film, *Roger and Me*, for illustrating "the significance of differing ethical perspectives." Although the ethical conflicts within *Roger and Me* may be obvious to many students, Hansen, King, & Mouritsen (2018, p 38) advocated "pre-scripts" in ethics education to "provide students with structured opportunities to learn how to strategically bolster a firm's 'ethical reputation.'" Another consideration is the possible difference in judgment between students in undergraduate and graduate ethics classes.

Other criteria and good practices that may help with film selection are as follows:
Each film should represent a *genre in which students have expressed interest* (see the "Other Considerations" section below).
Each film should be accompanied by *warnings for controversial issues* such as those issued by Disney and other content providers of classic films. This may help to prevent "triggering" of sensitive students.
Each film should have *a "non-Hollywood" ending.* The unexpected may have a bigger impact than what the student is expecting to see happen.
Each film should be *translatable into a business setting* while not necessarily set in a business environment.

Each film should be *set in a time and/or place unfamiliar to the students*. After all, the students may well be working in times/places with which they are unfamiliar.

Each film should be designed to *"draw the viewer into"* a situation that will require some viewer emotional investment in the situation.

LEGAL AND COPYRIGHT ISSUES

Penalties for violating copyright law are significant. Fines range from $750 to $30,000 per work infringed. For willful infringement, a court may award up to $150,000 per work infringed. Most all universities – large and small – have developed and disseminated to faculty clear copyright policies that describe the basic issues associated with copyright infringement. For example, Stanford University has an eighteen-chapter Research Policy Handbook that includes a chapter on Intellectual Property with very specific definitions and expectations (see the full document at https://doresearch.stanford.edu/policies/research-policy-handbook). Stanford's library also has an entire site devoted to copyright and fair use (https://fairuse.stanford.edu/). This site links to many other resources, FAQs, and current issues.

Even much smaller universities are making certain to clarify expectations around copyright to their faculty members. Hendrix College, for example, with around 1,100 undergraduate students and just under 100 full time faculty, has a clearly articulated copyright policy that begins with the following statement:

> It is the intent of Hendrix College that all members of the College community adhere to the provisions of the United States Copyright Law (Title 17, United States Code, Sect. 101, et seq.). The following policy statements and guidelines constitute a manual for anyone at the College who wishes to reproduce, alter, or perform works that are protected by copyright: https://www.hendrix.edu/uploadedFiles/Bailey_Library/College%20Copyright%20Policy.pdf

Whether that is the intention or not, these policies which may be found on most college campuses help pave the way for a copyright holder to claim that any faculty member's unauthorized use of a protected work amounts to willful infringement. Thus, it is entirely possible that a court would impute knowledge of these policies to faculty members and ultimately find any infringement to be willful.

The vast majority of the films discussed in this article will have been copyrighted at some point. While some may have expired, given the extensions of copyright protections in 1976 and 1998, even those films created before 1978 may have as much as 95 years of protection from the original date of copyrighting. Therefore, even the older films discussed in this paper likely have copyright protection. Newer films, created on or after January 1, 1978, have copyright protection beginning at the film's creation and lasting for the life of the creator plus an additional 70 years after the creator's death. If the film is a joint work, the copyright lasts 70 years after the death of the last surviving creator. But there are some exceptions.

The first exception applies to face-to-face (not distance) classrooms only. When a professor is using a film, video, or TV program for teaching or educational purposes, the entire work may be displayed without permission of the copyright holder based upon the exemption found at 17 U.S.C. §110(1). The verbatim language of 17 USCA § 110(1) clarifies that the following is not copyright infringement:

> performance or display of a work by instructors or pupils in the course of face-to-face teaching activities of a nonprofit educational institution, in a classroom or similar place devoted to instruction, unless, in the case of a motion picture or other audiovisual work, the performance, or the display of individual images, is given by means of a copy that was not lawfully made under this title, and that the person responsible for the performance knew or had reason to believe was not lawfully made.

The film may only be shown in spaces devoted to instruction – so streaming the video in dorm rooms and student center lounges would not qualify for the exemption. This means that there is significant freedom for professors to utilize films without obtaining a license or special permission in advance.

ACCREDITATION ISSUES

Regional and discipline specific accrediting bodies universally expect universities to deliver education of the same quality regardless of delivery mode. Faculty qualifications for those teaching face-to-face or in an online environment remain the same. For example, the Higher Learning Commission which accredits the authors' university, requires in Criterion 3.A.3 that "The institution's program quality and learning goals are consistent across all modes of delivery and all locations (on the main campus, at additional locations, by distance delivery, as dual credit, through contractual or consortial arrangements, or any other modality)."

AACSB, which accredits the authors' business unit, states in standard 5.2: "Programs resulting in the same degree credential are structured and designed to ensure equivalence of high-quality outcomes irrespective of location and modality of instructional delivery." Professors are accustomed to similar accreditation expectations for face-to-face and distance delivery. The fact that copyright law treats face-to-face and distance delivery so differently may come as a shock to many instructors – particularly those who built careers in the face-to-face environments and only transitioned to the online environment in the aftermath of the 2020 pandemic when they were forced to learn additional delivery modes. Prior to 2020, faculty members likely either taught in a face-to-face environment or online, and they were likely familiar with the copyright exceptions and limitations in their respective teaching environment. But now, with many professors enjoying the opportunity to teach in both settings, it will be necessary for instructors to be mindful of how copyright impacts both settings uniquely.

OTHER CONSIDERATIONS

Faith-based institutions may require that films depict a minimum of profane language or sexual situation and contain no nudity or excessive violence. Students may be put off by preachy films or soap operas and not notice ethical dilemmas. Closed captions should be available in case the film contains faint or unclear dialogue from sound quality or different accents. This may be accomplished through subtitles for the hearing-impaired. Films that are difficult to see, for example, because of low contrast images, may not be suitable for sight-impaired students.

Of the nearly sixty films suggested by Giacalone & Jurkiewicz, over 60 percent were produced in the 1990s with fewer than 2 percent from the 1960s and none produced before 1950. Science fiction, espionage, and other genres unlikely to be encountered in the typical work place were emphasized. Nearly 70 percent were rated "R," most with significant violence, nudity, and language that would not be allowed in most classroom discussions and many workplaces.

Politically polarizing films come with the real risk of distracting students from the salient issues that students are likely to encounter in work situations. The risk of stereotyping is real. But so are the contrasts between cultures as to *what used to be* acceptable behavior and *what is now* acceptable behavior. Most films are available at relatively low cost (available for streaming on Amazon Prime, Netflix, Hulu, Roku, etc.)

To allow for different student interests, the authors have sought student preferences between the following genres.

Ghost stories:
Black Narcissus (1947) technicolor
Strengths: addresses racism; technicolor cinema photography, "business" of religion from another viewpoint
Weaknesses: requires some elementary knowledge of Roman Catholicism
The Innocents (1961) black-and-white
Strengths: set in a nineteenth-century country estate; a child-care business relationship
Weaknesses: may require more than one viewing to understand situation and resolution

War movies:
Paths of Glory (1957) black-and-white
Strengths: addresses ethic bigotry directly; also deals with command incompetence and corruption
Weaknesses: black-and-white cinema photography
The Hill (1965) black-and-white
Strengths: addresses racism and homophobia directly; also deals with command incompetence and corruption
Weaknesses: black-and-white cinema photography; can be difficult for American audiences to understand without captions

Western movies:
Garden of Evil (1954) technicolor
Strengths: chronicles a commercial enterprise in nineteenth-century Mexico; addresses racism and sexual harassment
Ride the High Country (1963) technicolor
Strengths: chronicles a commercial enterprise in late nineteenth-century California; addresses sexual harassment and political corruption

Strong alternates:
The Bravados (1958)
They Came to Cordura (1959) - could double as either war movie or western

Weak alternates:
On the Beach (1959) preachy; prominent love story
The Man Who Never Was (1956) - only one prominent dilemma; prominent love story
The Manchurian Candidate (1962) – only one prominent dilemma; politically charged

In more than fifteen years of teaching undergraduate business ethics, the authors have found War Movies to be the most preferred genre at a small, faith-based institution, followed by Westerns. Ghost Stories have tended to finish last in student preferences.

CONCLUSION

Business ethics education and training is essential for business school graduates, whether taught primarily in a standalone course or sprinkled throughout the curriculum. Of course, the entire curriculum should reflect consideration of ethical behavior. But business ethics education need not be a matter of merely checking boxes on assessment and assurance of learning reports. Films can take a curriculum of what some students, particularly traditional undergraduates, might view as a stuffy and pedantic set of readings and lectures and transform it into a shared experience using unfamiliar yet relatable vignettes designed to influence behaviors in a positive way.

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An Experiential Exercise for Estimates and the Scale of Operations

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ABSTRACT

This article presents an experiential learning exercise that guides students in calculating estimates of the scale of operations related to the production and delivery of a simple product. The estimates of scale are calculations related to size, such as quantities or capacity. The context is business operations activity such as materials handling and transportation. Students take measurements of a product to estimate the quantity of the main component material. That quantity is used in generating estimates and assumptions about the scale of operations requirements such as storage space and transportation capacity. Students experience how estimates and assumptions can be generated to support decision-making. They experience how constraints and bottlenecks can be difficult to imagine but that building a frame of reference for scale can help. This exercise supports number literacy and builds skills in estimation and modelling of a problem context that are associated with creative problem-solving.

Keywords: experiential learning, number literacy, estimates, scale of operations, problem-solving

INTRODUCTION

This exercise creates a setting for students to generate estimates of the scale of operations. This setting of scale of operations refers generally to size in the operations activities of a business, including production, materials handling, and transportation. The estimates of scale will be measures related to size, such as quantities or capacity. Students estimate the quantity of an input material needed to manufacture a simple product. Further calculations estimate the amount of storage space and the size and number of vehicles to transport the material. This experience allows for a discussion of risks associated with scale and the implications for production capacity, time, and staffing levels.

The concept of scale is foundational in many business analyses. In contexts such as scaling up operations, scale is synonymous with size. A business that is scaling up is increasing its capacity to handle a greater level of activity, such as a larger number of products, customers, users, or transactions (Huang et al., 2017). When referenced in business research and analysis, scale of operations appears frequently in the context of economies of scale or returns to scale. Scale economies describes the relationship between input quantity, output quantity, and cost per unit of output; and the economies or returns to scale exist when an increase in output quantity is associated with a reduction in cost per unit (Fellows, Dollery & Tran, 2022). "Scale" can also refer to the relationship between inputs and outputs, meaning that a conceptual distinction can be made between economies of scale and economies of size (Fellows et al., 2022). However, the concept of scale also refers more basically to the quantity of, amount of, or capacity for inputs or outputs (Peixoto et al., 2022). In this way, scale is basically a question of how much or what size, and the terms "scale" and "size" can be used interchangeably to convey the idea of quantity or amount in operations. Helping students understand how size of business operations can be estimated can also facilitate their use of concepts based on quantity or capacity, such as economies of scale. Scale estimates also underlie process analyses such as identification of bottlenecks or capacity constraints when transferring from one step of a process to another (Peixoto et al., 2022).

Scale of operations has implications for sustainability in terms of understanding the size impact of an operation, the challenge of undertaking refinements in the process, and the quantities needed to sustain operations. Scale affects human resources in the amount of work, time, and number of employees needed. Even for students who have work experience, scale can be difficult to imagine due to that experience being limited or narrow. For example, someone working full-time at a restaurant could find it challenging to imagine the quantity of sandwich ingredients needed weekly by all 3,000 franchise locations for that restaurant. This exercise provides students with in-class experience with calculations that orient a decision-maker to scale.

In a problem-solving or decision-making situation, an effective analysis of resource requirements, time, space, and risk of different choices is facilitated by an ability to orient to the scale of the setting. Estimation and risk evaluation are elements of number literacy. Number literacy or numeracy includes basic concepts such as measurement and estimation as well as higher-level concepts such as proportions and probabilities (Reyna et al., 2009). Numeracy is associated with effectiveness in judgments and decision-making through factors such as validity of framing and

relevance of information used (Peters et al., 2006). Numeracy is associated with risk evaluation, interpretation of forecasts, and financial literacy (Cokely et al., 2012; Skagerlund et al., 2018). These factors are typical of business management decision situations.

A sense of scale and of relative numbers and quantities can be useful in the construction of estimates, forecasts, and assumptions for decisions. Ballpark estimates, approximations, and back-of-the-envelope calculations facilitate problem definition and context for creative problem-solving and experimentation. Forecasts of the implications of ideas and plans have been associated with creative problem-solving and the quality and originality of solutions (Byrne, Shipman and Mumford, 2010). Trial-and-error learning, prototyping, and modelling facilitate successful business model design and adaptation (Brunswicker, Wrigley and Bucolo, 2013). The ability to quickly orient to a problem context supports the pattern recognition that is thought to underlie business intuition through heuristics, rules-of-thumb, and experience (Williams, 2012) and can be useful in situations where formal analysis is complicated by the need for speed in a decision or by limited information.

DETAILS OF THE EXERCISE

This exercise provides classroom experience with assumptions and calculations for understanding the scale of operations of a business. The following sections provide instructions for conducting the exercise, including the preparation, instructions, and debrief. The exercise and debrief can be completed in a 75-minute class period. Depending on the math skills of the students, the instructor can increase or decrease the number and complexity of calculations to fit the exercise into a targeted amount of time. An example is shown in the appendix using a t-shirt for the product and shipping containers for transportation.

Learning goals
This exercise supports two learning objectives: (1) Students will learn calculations and approaches for estimating the scale of resources used in operations of business. (2) Students will learn how scale is associated with choices and risks in the sourcing and management of business operations.

Materials and preparation
This exercise requires a simple product made largely of one component material. Items that work well are made of paper or fabric, including paperback books, simple clothing items such as scarves or t-shirts, household storage or decorative items such as baskets or wall art woven from paper or fabric, or small, woven throw rugs or rag rugs. Sustainability has an added dimension in the discussion if the component material is recycled or recyclable such as paper from magazines or newspapers, natural fibers such as grasses, or clothing made of recycled or organic materials. Examples can be found through a general Internet search or online retailers such as Amazon and Etsy with searches posed as t-shirts or scarves made of recycled plastic, sweaters made of recycled wool or cotton, small woven throw rug, recycled magazine paper box, recycled newspaper basket, or decorative basket made of grass.

Students will need a means to measure the dimensions of the product. Of course, a ruler can be used. However, a less precise method will also be consistent with the estimation approach of the exercise. For example, because the size of a standard sheet of printer or notebook paper in the United States is known to be about 8.5-inches x 11-inches, these edges of known length can be used as substitutes for rulers for instructors or students interested in trying this approach.

The exercise uses measurements such as the number of feet in a mile or square feet in an acre and the dimensions of standard shipping methods including a tractor trailer, a shipping container, and a railroad boxcar. Students can retrieve the information from the Internet during the exercise, or the students or instructor can bring the dimensions to class.

Instructions for students
The instructor will determine whether the students are to work individually, in groups, or as a class, then, distribute the product or products and the instructions as stated below. If the instructor wishes to distribute a worksheet with the instructions and steps of the analysis, the example in the appendix could be used for this purpose by leaving blank the measurements, numbers retrieved from the Internet, and completed calculations to allow students to fill in the blanks.

The purpose of the exercise is to estimate the quantity of the main component material used in the product. Using that number, you then calculate estimates that illustrate the scale of handling the component material to produce inventory of the product. These estimates will include the total quantity of material if a large number of units of the product are made, the storage space to hold the total quantity, and the transportation capacity needed to ship the quantity of input

material. Finally, by making assumptions about the time of production, estimates can be generated for the staffing levels and the frequency of orders of material. Using the product provided to you, proceed through the following steps.

(1) Using measurements of the product, estimate as closely as you can the amount of input material used to make the product. For example, if you are analyzing a t-shirt, lay the shirt flat and measure the length and width. Because you are creating an estimate, you do not have to be precise with sleeves but can treat the shirt as rectangular in shape. Remember to double the measurements because there are two pieces of fabric (front and back) used in the shirt. You can state the quantity of fabric in square inches, square feet, or square yards (fabric is often measured in yards). If you are measuring a woven item such as a box made of paper or a rug made of fabric, remember to measure and count both the vertical and horizontal strips. For a book, multiply the area of a page by the number of pages.

(2) Assume that (a) 10,000 units of the product are manufactured and (b) 100,000 units. What quantities of the component material are required (e.g., how many square feet of fabric or paper)?

(3) Estimate the storage space (i.e., warehouse space) required for quantities estimated in the preceding questions. Work with either the completed product (from step 1) or with the quantity of input material (from step 2). Step 3 requires volume (i.e., cubic measure) rather than area.

(4) Estimate the space required on a mode of transportation (e.g., how many shipping containers, etc.). Use the dimensions for a standard highway tractor trailer, for a shipping container, and for a railroad boxcar. How many of the containers or cars are needed?

Debriefing
The debriefing suggestions will refer to the t-shirt example shown in the appendix. However, the steps will be relevant for any product.

Review the calculations
If the calculations were not worked as a class, the debrief can begin with sharing the answers to the calculations. If students worked individually or in small groups, the resulting numbers will likely vary. For example, students might have different measurements for the t-shirts, and they could retrieve different inputs from Internet searches for the typical number of containers on a ship. These variations are useful for the discussion as they illustrate the effects of different estimates on the calculations. Students might need prompting and encouragement to put projections on paper. Students can learn that numbers on paper are a starting point and that multiple revisions to variable values are not errors but are expected. They experience how constraints and bottlenecks can be difficult to imagine but that building a frame of reference for scale can help.

The discussion of the exercise can call attention to how students' measurements, estimates, or assumptions can vary from their classmates' at various stages of the process. Examples can illustrate how different estimates in early stages of the analysis affect the results calculated at later stages, such as the difference in estimate of material quantity affecting the scale of storage if the company manufactures 100,000 units. Questions can also address what implications the scale of material has for the operations such as the choice of storage, choice of transportation, timing of deliveries, and capacity of the production process.

Approximations
The calculations are based on approximations. The instructor can ask the class to identify which numbers are firm and which are estimates. For example, converting cubic inches into cubic feet is a standard, firm measure. By comparison, the cubic inches size estimate for the folded t-shirt is approximate. The discussion can address how much variation is likely to occur in the approximations.

Assumptions
In addition to approximations, the analysis uses some assumptions that can affect the results. This exercise demonstrates that even when we are unsure of exactly how a process works, it is still possible to proceed with an analysis by making some assumptions about how it might work. But it is important to recognize the assumptions and the role they are playing in the analysis, and the debrief of the exercise can illustrate this point by identifying where assumptions are used. The example shown in the appendix has made an assumption about how the product is folded for shipment. Additionally, the example has not accounted for the size of any packaging or packing material such as

boxes to hold certain quantities of t-shirts. Handled this way, the analysis is essentially assuming that packaging is quite minimal as it might be with plastic wrapping, for example.

Purpose and applications
It can also be beneficial in the debrief to discuss the purpose of estimates. Back-of-the-envelope calculations to provide a sense of scale are not intended to be exact, but they do need to be in the ballpark to be helpful. The t-shirt example focuses on size in terms of quantity of material and storage capacity. These estimates can be useful for purposes such as determining the warehouse capacity or the number of trucks to move the shipping containers.

Estimates are useful and necessary when developing new products. The role of a prototype of a product in forecasts and production estimates can be discussed. Imagine that the product being analyzed is a prototype of a new product under development. How does information obtained from measuring the prototype facilitate forecasting and help in the identification of workable solutions for design and production?

Questions that highlight the implications of scale for risk and sustainability of operations include: What is the effect of increasing scale on the likelihood of maintaining a reliable source of supply for the input material? Can one supplier handle the needed quantity? Should the operations rely on one supplier? Where could bottlenecks arise? If the input is a recycled material, how does obtaining the recycled component add complexity to the process? How does an increase in quantity affect the ability to obtain a sufficient supply? If the material is recyclable after the product is used by the customer, how does scale of the sales affect the recycling process (e.g., in terms of how widely distributed the products are sold, how they are collected for recycling, etc.)?

Variables that are not used in the exercise as described here could be presented in the debrief to illustrate that the estimation skills are transferrable to other measures and settings. For example, weight and time also affect capacity in operations. The analysis also has not considered cost. Estimates of cost serve purposes such as identifying stages of the operations that would benefit from efforts to improve efficiency. Applying the estimating procedures to commodities that are transported in bulk, such as gravel or grain, can illustrate how the estimation skills transfer. Considering the bulk commodities, for example, the discussion could address what assumptions need to be adjusted and what questions about the transport are different than those about the transport of containers?

Visual comparisons
Another way to demonstrate how the scale estimates can be used to gain insight into an unfamiliar setting is to make comparisons with familiar objects or locations. The size of a shipping container can be compared with the size of the classroom. The size of a building on campus can be compared with a ship. For example, if an adult stride is about one yard long and it takes about 100 strides to walk from one end of the building to another, students can estimate that the 300-foot building is about one-fourth the length of a 1,200-foot container ship.

Pictures and videos can add to the frame of reference provided by the calculations in this exercise. Pictures are available online showing warehouse interiors. Pictures of containers stacked at ports can illustrate, for example, why the calculations in the appendix example suggested that containers would be stacked three high. Videos available on YouTube will show container ships loading and unloading, cargo loaded onto trucks or rail or airplanes, and materials handling in warehouses. Videos showing manufacturing processes can facilitate understanding of the input materials and packing for shipping. Relevant videos could include production of t-shirts or other clothing, recycling of old fabric into new fabric, or how common consumer goods and household decorative furnishings are manufactured.

Effectiveness and Extensions
Some indication that the exercise accomplishes the goals of improving student understanding of scale of operations and implications of scale can be seen in student responses to survey questions. The students' perceptions of what they learned from the exercise demonstrate that they found it helpful. When asked if the calculations provided a frame of reference for understanding the industry operations, 100 percent responded either agree or strongly agree on a five-point scale. Regarding specifically the scale or size of operations, 84 percent either agreed or strongly agreed that the exercise helped with understanding the scale.

The exercise as described in this article is completed in class to facilitate discussion. If it were to be used as a graded assignment, it is recommended that some of the discussion topics be presented in short essay questions to encourage reflection on the purposes and uses of the calculation.

This exercise can be implemented for an online class because most students will have an appropriate product such as a t-shirt or paperback book at home. Students who do not have access to a physical product can find descriptions and measurements of products with Internet searches and on retail websites. The discussion questions can be completed either synchronously or asynchronously. Experience using spreadsheets can be included by having students enter their calculations as formulas in Excel or another spreadsheet program.

CONCLUSION

This exercise provides in-class experience with orienting to a decision setting through estimates relevant to the scale of an operating situation. The calculations and related discussion cover the concepts of resource requirements, time, space, and risk of operating alternatives. This exercise supports number literacy and builds skills in estimation and modelling of a problem.

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APPENDIX

Example of size calculations using t-shirt

A. Measurements of t-shirt
1. Measure the t-shirt, treating it as an approximate rectangle lying flat.
T-shirt general dimensions, laid flat: length x width = 28 inches x 22 inches = 616 square inches

2. Fold the t-shirt approximately three times (in half length-wise, half again top-to-bottom, and half once more) as it might be packaged if shipped. Measure the folded shirt, which will now be thick enough for measuring three dimensions.
Folded t-shirt: length x width x height = 11 inches x 7 inches x 0.75 inches = 57.75 cubic inches
Convert cubic inches to cubic feet (by dividing by 12 x 12 x 12 = 1,728) = 0.03342 cubic feet

B. Amount of input material
1. In part A1, the dimensions of the t-shirt were measured. Multiplying by 2 will approximate the quantity of fabric in the shirt (because there is a front and back to the shirt).
Area dimensions of shirt x 2 = 616 sq. in. x 2 = 1,232 sq. in. of fabric per shirt

2. Convert the square inches measurement to square yards by dividing square inches by 36 x 36 = 1,296 sq. in. per sq. yd.
Sq. in. of shirt converted to sq. yd. = 1,232 sq. in. / 1,296 = 0.95 sq. yd. per shirt

3. Assume that 10,000 t-shirts are manufactured. Calculate the quantity of fabric for the input material.
Sq. yd. per shirt x 10,000 shirts = 0.95 sq yd x 10,000 shirts = 9,500 sq. yds.

4. Assume that 100,000 t-shirts are manufactured. Calculate the quantity of fabric input.
Sq. yd. per shirt x 100,000 shirts = 0.95 sq yd x 100,000 shirts = 95,000 sq. yds.

C. Estimated warehouse space for completed shirts
We measured the size of each completed shirt in step 1.
1. Cubic feet of storage required for 10,000 completed shirts
Cubic feet per shirt x 10,000 shirts = 0.03342 cu. ft. x 10,000 shirts = 334.2 cu. ft.

2. Cubic feet of storage required for 100,000 completed shirts
Cubic feet per shirt x 100,000 shirts = 0.03342 cu. ft. x 100,000 shirts = 3,342 cu. ft.

3. An Internet search will provide the height of a typical warehouse. Using that approximate height, estimate the floor area needed for storing the completed product.
Common clear height of warehouse = 25 feet
For 10,000 shirts, length x width x height needs to hold 334.2 cu. ft. Using trial and error plugging numbers, can find one size to accommodate the quantity would be 8 ft x 8 ft x 5.3 ft = 340 cu. ft. Another size combination would be 6 ft x 6 ft x 10 ft = 360 cu. ft.
For 100,000 shirts, length x width x height needs to hold 3,342 cu. ft. Using trial and error plugging numbers, can find one size to accommodate the quantity would be 25 ft x 12 ft x 12 ft = 3,600 cu. ft.

D. Estimates of shipping sizes
Clothes such as t-shirts are examples of products that are often transported in standard shipping containers. Assuming that they are shipped after they have been manufactured, we will return to our size estimates in Part A. From our shipping size estimates for the folded shirt (cubic inches and cubic feet from part A2), we have an estimate of the space one folded shirt requires. We need to compare to the space available in a shipping container.

1. An Internet search will provide the dimensions of a typical 20-foot shipping container. Use the interior dimensions. (Different builders might differ in size. Choose one example.)
Dimensions of 20-foot shipping container: 19'3" x 7'8" x 7'10"

2. Calculate volume capacity of the container. (You can convert the dimensions to inches or to feet for multiplying.)
Dimensions stated in inches = 231" x 92" x 94" = 1,997,688 cubic in. Convert to cubic feet by dividing by 12 x 12 x 12 = 1,728. Conversion = 1,997,688 / 1,728 = 1,156 cu. feet
Or Dimensions stated in feet = 19.25' x 7.667' x 7.833' = 1,156 cu feet

3. Number of t-shirts that will fit into a container. Divide container volume by shirt volume.
Container volume / shirt volume = 1,156 cu feet / 0.03342 cu feet = 34,590 shirts
Or working in inches: Container volume / shirt volume = 1,997,688 cu in / 57.75 cu in = 34,592 shirts

4. Number of containers for shipping 100,000 t-shirts = 100,000 shirts / Number of shirts per container = 100,000 / 34,592 = 2.9 containers

5. Additional calculations about space required for containers and scale of container operations
The preceding calculations have focused on contents of containers. We can also calculate estimates about the containers which will give us an idea of the container-handling operations and the quantity of cargo moving by container and through ports. Many containers are transported by ocean-going ships.

a. An Internet search will provide the number of containers on a ship. Ship sizes can vary widely; choose one size from the range. Because we are now looking at the handling of the container, we will need external dimensions for the 20-foot container (we used internal dimensions earlier).
Number of containers on a ship = 15,000
External dimensions of 20-foot container = 20' long x 8' wide x 8' 6" high

b. Space occupied by containers at a port when a full ship is unloaded to the ground
Ground area occupied by a container = length x width = 20' long x 8' wide = 160 sq. ft.
Assume that containers are stacked three high, meaning that ground area is needed for 1/3 of the shipload.
Number of containers on ship / 3 = 15,000 / 3 = 5,000 containers for estimating ground space
Total ground space needed for shipload of containers = Number of containers on ground x area of one container = 5,000 containers x 160 sq. ft. = 800,000 sq. ft
Convert sq. ft. ground space to acres = Ground space for containers sq. ft. / 43,560 sq. ft. per acre = 800,000 sq. ft. / 43,560 sq. ft. per acre = 18.37 acres

A Comparison of Alumni to Undergraduate Student Mentoring Programs at Top-Ranked Business Schools

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ABSTRACT

Much has been written about the benefits of mentoring for both the mentors and the mentees, as well as the organizations involved. There are a variety of mentoring relationships available to undergraduate business students – peer to peer, faculty to student, graduate student to undergraduate student, and alumni to student. This paper provides a synopsis of alumni to undergraduate student peer mentoring programs at the majority of the top-ranked business schools. Four key points of distinction among the programs are documented and discussed.

Keywords: mentoring, undergraduates, alumni, business schools, points of distinction

INTRODUCTION

Mentoring programs offer mentees and mentors the opportunity to become more engaged members of the business school community and for the college to stay connected with its alumni. Mentoring provides benefits both to the participants and the organizations involved in the mentoring process. Here is a brief listing of some of those benefits:

- Mentoring is related to positive career outcomes such as increased compensation, salary growth, and promotions as well as greater career and job satisfaction (Allen, et al, 2004).
- Mentorship can be part of creating an inspired learning environment, resulting in a lifelong source of inspiration and energy for graduates who later become executives (Bowen, 2014).
- Mentorship can create an effective environment for interdisciplinary and ethical thinking (Peterson, 2009).
- Mentors can provide useful insight as to what courses and activities have value, since they have taken the career path that students are pursuing (Grant, et al, 2016).
- Mentoring can be especially valuable for minorities and women (Zambrana, et al, 2015).
- Mentoring can enhance professional confidence in participants (Forret, et al, 1996).
- Mentoring makes both the mentor and the mentee feel more included (Smith, 2017).
- Compared to non-mentors, mentors experience higher job satisfaction and organizational commitment (Ghosh and Reio, 2013).
- A mentorship program at one university enabled students to develop both professional and personal skills, including leadership. Additionally, the mentors reported the relationship enabled them to develop their own leadership skills (Priest and Donley 2014).
- Alumni mentors can "provide career guidance, encouragement during the academic program, advice on important course and field work, and opportunities to make professional contacts" (Dragovich and Margeton, 1995).
- Accounting practitioners found that they can make an important contribution by helping students understand the challenges and rewards of practicing accounting. By participating in a mentoring program at a college or university, practitioners can make contact with future graduates and influence their career decisions (Weinstein and Schule, 2003).
- One university found that from the mentees' point of view, self-confidence, employability skills, and networks were enhanced. Mentors reported satisfaction in contributing to the local community (Spence and Hyams-Ssekasi, 2015).
- Students can enhance and gain exposure to a specific industry. Mentors had satisfaction in guiding the students, and the experience enabled them to refresh their technical and soft skills (Renuga and Enhila, 2014).
- Mentoring programs provide alumni the opportunity to contribute in a non-monetary way to their alma mater. Mentorship programs also give alumni the opportunity to cultivate and recruit promising young people to their place of employment after graduation. These programs are also effective recruitment and retention tools for universities and enable universities to strengthen ties to alumni (Pfeifer, 2002).
- Alumni mentoring programs provided distinct benefits to both students and alumni and could result in improved university engagement (Dollinger, et al, 2019).

- After a mentoring experience, students felt more confident, had greater career clarity, and felt less anxious in the present by knowing more about possible future career directions (Conner, 2015).

Despite these numerous benefits, Schlee (2000) found that less than half (41%) of the business schools contacted indicated their university had mentorship programs for business students. Another 3% stated they had an informal mentorship program, and 4% indicated they planned to start a mentorship program the following academic year.

Fontana and Burton (2020) noted that in response to a job market ravaged by the coronavirus pandemic, many colleges and their alumni associations tapped into their extensive networks of former graduates to create job-matching programs for seniors who had yet to find positions. The efforts were aimed at sparing the class of 2020 from the lasting effects of graduating into a recession. Among those efforts were newly launched mentoring programs, such as one at the University of Colorado.

OVERVIEW OF MENTORING PROGRAMS

Given all these benefits, it is not surprising that many universities offer some type of mentoring program involving their undergraduate business students and alumni. In order to provide an up-to-date look at the state of mentorship programs available to business students today, this paper offers a brief descriptive overview of alumni-based mentoring programs at a variety of schools. Using the most recent Poets and Quants rankings of the top 25 undergraduate programs (Allen, 2023) as a starting point, a search of each school's website was undertaken. A similar approach was used successfully when comparing Introduction to Business School courses at the top 25 undergraduate programs (Borden, 2016). Based on this analysis, it was discovered that the websites of 21 of the 25 schools specifically discuss some type of alumni-based mentoring program available to their undergraduate business students. Information from those websites was condensed and is presented in this section to provide useful information and to facilitate the subsequent analysis in this paper. While the set of schools whose program information is presented in the following pages are likely not representative of all business schools, information regarding the variety of approaches to mentoring programs should be useful for all schools. In addition, the hope is that this paper will encourage others to bring to light some innovative approaches to mentoring programs that are not captured by the schools described below.

It should be noted that many of these schools have other types of mentoring programs, such as peer to peer mentoring or graduate to undergraduate mentoring. These types of mentoring programs are not included in this paper. Note also that this section of the paper only presents the subset of information from university websites about alumni-based mentoring programs that is either (a) relevant to the analysis that follows and/or (b) should be of interest to all universities that seek to begin or enhance alumni-based mentoring programs for business students.

Bucknell University (University-wide Herd Mentorship Program)
The Bucknell University Herd Mentorship Program provides first-year students the opportunity to connect with alumni that will support them during their transition to college. Since its inception in 2018, over 650 students have been matched with an alumni mentor from one of eight different organizations.

Participating students are given the resources to lead the engagement with alumni mentors with support from the Center for Experiential Learning. Mentors help first-year students build a professional network, gain confidence in a new community, and explore paths and opportunities. This fosters a strong connection between the current students and Bucknell alumni. Students are matched 1:1 with mentors at the beginning of the Fall semester.

[T]he mentoring program is managed by the Center for Experiential Learning and there are specific commitments and expectations for program and organization participants. The expectation is that student mentees communicate with their assigned mentor approximately once a month, at least 8 times throughout the length of the program.
https://management.blogs.bucknell.edu/mentorship-program/

Cornell University (Two SC Johnson College of Business Programs)
1. [T]he Cornell Family Business Mentorscape… provides year-round access to our slate of mentors. The SFBI [Smith Family Business Initiative] has created this mentors' platform with the goal of connecting our Cornell students and recent alumni with the vast expertise within the SFBI network.
https://www.johnson.cornell.edu/smith-family-business-initiative-at-cornell/students/sam-seltzer-mentors-forum/mentorscape/

2. Accelerator Scholars Program: Cornell SC Johnson College of Business, in partnership with leading global investment firm KKR, announced a new program called the Accelerator Scholars Program for Cornell students who are the first in their family to attend college…. It will focus on professional and life skills, mentorship, coaching, networking, and relationship-building…. KKR's participation will support 50 students from the classes of 2026 and 2027, in addition to 17 upperclassmen mentors, throughout the year for activities including virtual career sessions, mentoring with KKR Cornell Alumni, mock interviews and more. Program participants will also be invited to visit KKR's headquarters in New York City…. Mentor activities will include monthly "Lunch & Learn" workshops, regular meetings, networking opportunities, a career trek, cohort events and meetings with KKR mentors.
https://business.cornell.edu/hub/2023/06/15/new-program-for-first-gen-undergrads/#:~:text=The%20Accelerator%20Scholars%20program%20is,Pre%2DCollegiate%20Summer%20Scholars%20Program.

Emory University (Goizueta Business School Student-Alumni Mentor Program)
The goal of the program is to help business students--BBAs, MBAs, MSBAs, Evening and Executive MBAs--bridge the gap between the academic and professional world through the practical insights, coaching, and experience of the worldwide Goizueta alumni network.

The objective is to provide both our student mentees and alumni mentors an opportunity to develop meaningful relationships that promote career progression and advancement. Student mentees and alumni mentors are matched one-to-one based on a unique set of criteria. The academic-year program allows for students to have an alumni resource as they complete their studies at Goizueta Business School.
https://goizueta.emory.edu/alumni/engage

Fordham University (University-wide Fordham Mentoring Program)
Through the Fordham Mentoring Program, students and alumni engage in a minimum of 24 hours (less than an hour a week) of one-on-one mentorship over the course of the academic year…. During the fall semester, undergraduate junior and senior students are carefully matched with alumni mentors based on commonalities in their personal and professional profiles…. The program is anchored by several events, regular checkpoint surveys, and program-specific goals. Beyond that, mentor-mentee pairs are free to plan the remainder of their 24 hours however best fits their respective schedules.

Your mentor can assist in your professional development, help you set goals for life after graduation, and help you make career-related decisions over the next year.
https://mentorshipnetwork.fordham.edu/hub/fordham/programs/fordham-mentoring-program/about

Georgetown University (McDonough School of Business Alumni-Student Mentoring Program)
[The program] links current undergraduates with Georgetown McDonough alumni…. Mentors and protégés meet throughout the semester to discuss topics such as interviewing skills, resume design, networking/dining etiquette, internship/employment search, and any other career-related topic that comes to mind…. Students are matched with an alumnus/a whose professional experience aligns with the student's field of interest. We cannot guarantee that every alumni and student will be matched in the program. Students are expected to connect regularly with their mentor and to complete personal and professional goals assigned to you by the assigned due date. Mentors are expected to connect regularly with their mentee, help their students set and achieve goals, and expose the students to potential career opportunities.
https://hoyagateway.georgetown.edu/hub/hoya-gateway/programs/mentoring-program/about

Georgia Institute of Technology (Two University-wide Programs)
1. Mentor Jackets: The 1-1 Mentoring Program partners current SAA [Student Alumni Association] members with Tech alumni in year-long dedicated mentoring relationships based on similar interests and background…. [Time is] [d]etermined by mentor and mentee pairs; recommended at least once per month.

2. Network on GT Connect: The Network opportunity is a less formal option, connecting students and alumni for one-time support for things like exploring new majors, informational interviews, moving to a new city, etc.
https://www.gtmentorjackets.com/s/1481/alumni/17/interior-wide.aspx?sid=1481&gid=40&sitebuilder=1&pgid=11083

Indiana University (Two Kelley School of Business Programs)
1. [Kelley School of Business] has joined forces with Talent Nexus, a community-based mentoring initiative, to provide mentoring for women…. Talent Nexus is a model of mentoring designed to help employers attract, retain and develop talent. The program uses a software system to help women build the skills they need to be good mentors as well as connect with other qualified mentors in the business community…. First, our students will get training on how to get the most out of a mentoring relationship and how to be both a good mentor and a good mentee. Second, they will have access to a wide variety of mentors in the Indianapolis business community.
https://www.wrtv.com/news/local-news/kelley-school-of-business-celebrates-national-womens-day-with-mentoring-partnership

2. BLI [Business Leadership Initiative] Connect is a mentorship program exclusively for BLI members. [*Note: BLI is a Jewish student organization within the Kelley School of Business.*] BLI students will be paired one-on-one with BLI alumni who have signed up to be members of our BLI-N program (BLI Alumni Network). These alumni are ready and willing to help you reach your personal and career goals through their industry experience and wealth of knowledge. They are here for you to provide you with important career advice, mentorship and networking opportunities…. Mentoring connections will be made based on BLI attendance. Only active members – those who have attended at least two BLI events this school year – will be eligible for a mentorship pairing.
https://hillelatiu.wufoo.com/forms/s1j0xbmf0165q0q/

New York University (Stern School of Business Alumni Career Engagement Program)
[The program] provides an opportunity for you to network with and receive personalized career guidance from alumni. Alumni meet with you in small groups to share advice on careers and life after Stern.
https://www.stern.nyu.edu/portal-partners/current-students/undergraduate/professional

Northeastern University (University-wide McCarthy(s) Venture Mentoring Network)
The McCarthy(s) Venture Mentoring Network (VMN) is a university-wide resource available to all Northeastern students, faculty, and alumni ventures. The goal of the VMN is to pair Northeastern entrepreneurs with high-quality, experienced mentors that can help address business challenges and make our ventures more successful.
https://vmn.sites.northeastern.edu/

(Note: Mentorship also is built into the D'Amore McKim School of Business Co-op Program. Per the program website, "Supervisors partner with their co-op students to develop learning objectives and goals at the beginning of their co-op, coach and mentor them throughout the co-op experience, and then review the student's performance in an online performance appraisal and during a one-on-one meeting at the end of their co-op experience." https://damore-mckim.northeastern.edu/cooperative-education/employer-faq/)

Southern Methodist University (SMU) (Cox School of Business BBA Mentoring Alliance):
The BBA [Bachelor of Business Administration] Mentoring Alliance is a professional mentoring experience that pairs business undergraduates one-on-one with executives in the Dallas-area business community. The Mentoring Alliance enhances a student's collegiate experience by providing firsthand insights into the business world while teaching the value of effective networking. Eligibility for the mentoring program requires a declared major in business, junior or senior status, and good academic standing. B.B.A. students on academic probation are not eligible to participate. After acceptance into the program, students are matched with a mentor for an academic year.

This rewarding 10-month program connects alumni/friends of SMU with BBA student(s) and is designed to empower professionals and students alike by establishing and cultivating long-term professional relationships.
Sophomores, juniors, and seniors from all our business majors are eligible to join the BBA Mentor Alliance Program.
https://catalog.smu.edu/preview_entity.php?catoid=14&ent_oid=1220&returnto=547#bba-mentoring-alliance
and https://www.smu.edu/cox/Centers-and-Institutes/Career-Management-Center/Students#chapter-1

Texas Christian University (TCU) (Three Neeley School of Business Programs)
1. Neeley Mentorship Program: Our TCU Neeley Mentorship Program connects successful alumni mentors with sophomore business students – a critical point for students in their professional development. Our mentors serve as advisors and allies, helping students expand their professional skills, explore potential careers and gain access across industries…. Our mentorship program is part of a professional development curriculum created and delivered by a student executive board made up of junior and senior business students who were mentees as sophomores…. Our 10-week program is offered in the spring semester. We ask mentors and mentees to commit to one meeting per week.

Mentees also participate in weekly learning sessions on professionalism and career exploration, including access to alumni career panels, delivered by the student executive board…. We aspire to connect mentors and mentees with similar career interests. Whenever possible, we will prioritize matches that allow for in-person meetings.

2. Mentorship of Neeley Fellows: [T]his is a more structured alumni coaching program for our juniors, in which alumni lead teams of both students and fellow alumni. [*Note: Neeley Fellows is an undergraduate business honors program.*]

3. JPMorgan Chase Inclusive Excellence Mentoring Program: Make a generational difference in the lives of our historically underrepresented students. This program is designed to increase retention and graduation rates by enhancing the student's personal support system through mentorship. The program will focus on professional development and creating a pathway to compelling career opportunities.
https://neeley.tcu.edu/Alumni-5df9a675f682c457839530b30c743f6d/Neeley-Mentorship-Program and
https://neeley.tcu.edu/Alumni-5df9a675f682c457839530b30c743f6d/How-You-Can-Support-Us/Become-a-Mentor

University of Michigan (Ross School of Business (RSB) Ross Mentorship Program)
The Ross Mentorship Program (RMP) acts as a central hub for mentorship activities at Ross and facilitates networks between the members of the University of Michigan Business School community. These mentorship opportunities will allow students to benefit from the knowledge and skills of others who have had similar experiences in the RSB community and ensure that the RSB knowledge, tradition and culture are passed from one year to the next. RMP is also committed to developing stronger bonds between recent alumni and current students.
http://websites.umich.edu/~rossrmp/index.html

University of Minnesota (University-wide Maroon and Gold Network)
Whether you're a recent grad, or lifetime member, alumni all have something in common: a desire to connect and help each other. Career advice, networking, a chance to mentor or seek mentorship, and countless resources are all available to you here, in one place.

Discover your path. Build social capital. Explore different majors and industries. Get resume advice and hone your interview skills. Employers are looking for specific skills and experience - alumni mentors may hold the key.
https://maroonandgoldnetwork.umnalumni.org/v2/

University of Notre Dame (University-wide President's Circle Mentor Program)
The President's Circle Mentor Program is a three month program throughout the duration of the summer to connect students to members of the President's Circle council. Students will engage in conversation with their designated mentor throughout the summer months. With three touch points between the student and the mentor, students will be given the opportunity to ask their mentor about a variety of topics such as academic experiences, interviewing, networking, work/life balance, and transitioning into a professional workplace post-graduation. The President's Circle Mentor Program is a prestigious mentor program that provides students the opportunity to connect one-on-one with some of the most trusted, loyal leaders from the Notre Dame family.
https://undergradcareers.nd.edu/programs/presidents-circle-mentor/

University of Richmond (Robins School of Business Mentoring Program)
This group of about 50 senior executives works directly with the Robins School's deans, faculty, and students. The backgrounds of these executives include investment banking, consulting, manufacturing, consumer goods, real estate development, hospitality/hotels, small business, accounting, and much more. Serving as student mentors, members help students by:
- Meeting one-on-one with students to provide general career coaching and advice
- Providing input regarding specific career questions/issues
- Assisting in outlining an internship or job search strategy
- Helping define strategies for ongoing growth and professional development

Participating students are carefully matched with a mentor, based on shared professional goals and interests.
https://robins.richmond.edu/career-development/professional-skills/mentor.html

University of Southern California (Marshall School of Business Career Advantage Program)
The Career Advantage Program (CAP) is offered through the Marshall Undergraduate Career Services Office and provides Marshall undergraduate sophomore, junior and senior-level majors the opportunity to be paired with Marshall

alumni and friends of the university. A CAP mentor will assist their mentees in developing the professional, interpersonal and networking skills critical to their career success… Mentors and their groups of 2-3 students connect and grow through professional development and social activities… More than 350 students and 125 mentors across all business disciplines participate in CAP every year. CAP is hosted on USC Marshall Connections, our career development and professional networking hub open to Marshall and Leventhal [School of Accounting] alumni and students. The hub facilitates the CAP mentor-mentee matching process as well as connections throughout the academic year.

CAP is a competitive program and eligible students are NOT guaranteed a mentor. Students who have participated in CAP previously must reapply if they would like to return, and no preferential admission treatment is given to returning CAP students.

[Mentors must] be located in Southern California. Mentors should be able to mentor at least 2 mentees and commit to a minimum of five (5) hours per month for an entire academic year, and attend two mandatory CAP Events.
https://students.marshall.usc.edu/current-students/career-services/students/career-advantage-program-cap

University of Virginia (UVA) (University-wide Virginia Alumni Mentoring)
Our virtual community builds relationships between UVA alumni and students to support their growth and development. Students reach out to alumni mentors who share knowledge and experiences to help current UVA students while on Grounds and beyond…. Whether it be through quick 1-1 conversations, semester-long mentoring, groups, or any of our other helpful resources, VAM has something for everyone however you decide to engage.
https://alumnimentoring.virginia.edu/v2/

(Note: The McIntire School of Commerce at the University of Virginia also invites alumni "mentorship" in forms ranging from "serving as a class guest speaker or a panelist on an industry discussion, to offering advice at a one-on-one coffee chat." https://alumni.mcintire.virginia.edu/)

University of Washington (UW) (Foster School of Business Undergraduate Mentorship Program)
UW Foster Undergraduate students are invited to participate in the Mentorship Program that is led by Foster Career Services and the Foster School Alumni Association. This program is created to offer intentional mentorship for students of which they will be paired with a professional UW Foster alum as an early career resource where the students can build and develop professional relationships and networks, as well as receive academic and early career advice.

Students will be matched with a mentor based on interest. Each mentor meets with their mentee for the duration of the Winter and Spring Quarters, meeting at least once per month. Mentors and mentees are also encouraged to attend the monthly program event centered around a professionalism and/or DEI topic. [*Note: The Foster School of Business website indicates that the mentorship program also includes a "kick-off and training" session.*]
https://foster.uw.edu/foster-alumni/foster-undergraduate-mentoring-program/

University of Wisconsin at Madison (UW) (Wisconsin School of Business Madison Business Mentoring)
Madison Business Mentoring (MBM) is a student organization affiliated with the Wisconsin School of Business that helps students prepare for the business world by pairing each student with a professional mentor. Mentors are UW graduates currently working in a variety of business disciplines or MBA students with prior work experience.

Founded in the fall of 2010 by five Wisconsin School of Business students and advised by the BBA, MBM aims to encourage professional development and help students of all majors gain insight into the post-graduation phase by setting the stage for a strong mentoring relationship.

(Note: The MBM membership requirements indicate that the program is for one academic year and that participants are required to meet once per month with their mentors. Students must also complete an end of the year survey and attend any additional meetings.)
https://win.wisc.edu/organization/mbm

Villanova University (Villanova School of Business (VSB) Mentor Program)
The VSB Mentor Program brings VSB students and alumni volunteers together in one-to-one relationships to support the student's career and professional development goals.

Students select their alumni mentor (using the mentoring platform Chronus) based on their field of interest, desired work location and development areas. They outline goals and engage with mentors on how to achieve success. Students are eligible to join once they have declared their major in January of their sophomore year…. Mentees and mentors are encouraged to connect for a live monthly discussion from the time they are paired through the mentee's graduation.

Mentors work with mentees in one-on-one relationships to facilitate career exploration, help with interview preparation, internship and full-time job searches, and share industry insights as well as networking, communication and leadership tips.

(Note that the VSB Mentor Program events include a kick-off, meetup, game watches and a day of service. Junior and senior mentees also can participate in one-time "flash mentoring" with a different alumni mentor.)
https://www1.villanova.edu/university/business/academics/undergraduate-programs/professional-development/mentor-program.html

Washington University in St. Louis (Olin School of Business Mentor Programs)
Olin Mentor Programs fosters relationships between alumni and current BSBA students and complements the academic curriculum with exposure to the business community. Students are able to explore different industries, review career paths and fine-tune their career goals. The program pairs Olin undergraduate students with alumni for a year-long mentoring relationship.
https://olin.wustl.edu/EN-US/alumni/Pages/Student-Interaction.aspx

FOUR KEY POINTS OF DISTINCTION

Based on the online descriptions, there are both commonalities and significant variations among alumni-based mentoring programs offered to business students. Highlighting these commonalities and differences provides useful information for those schools seeking to begin or enhance mentoring programs.

One-to-One v. Group Mentoring

Most programs that explicitly discuss the mentor-to-mentee ratio note that students are matched in one-to-one relationships. This is not always the case, however. At New York University, for instance, alumni meet with students in small groups; at the University of Southern California, mentors connect with groups of 2-3 students. Business schools should carefully consider this dimension of mentoring programs. One-to-one relationships provide the benefit of individualized attention and guidance (Yon, 2023), and the intimacy can result in deep and trusting relationships. The ability to develop strong relationships is a critical skill and, in careers with multiple options for specialization and development, trusting relationships are of primary importance (Hoy, 2011). On the other hand, group mentoring can help mentees feel less intimidated and can mitigate problems created by personality clashes (Carvin, 2011). Additionally, to the extent a program has a shortage of top-quality mentors, the group approach could help maximize the number of students that are served.

Years of Student Eligibility

The available mentoring programs differ significantly regarding the years of student eligibility. In several cases, the participating mentees must have already selected a major and/or must have obtained junior class status. In such cases, business schools should be aware of the potential for mentorship *prior* to major selection to result in better academic and career outcomes. For instance, mentorship can enhance feelings of inclusion (Smith, 2017) and professional confidence (Forret, et al, 1996), and can create an inspired learning environment (Bowen, 2014). The research of Weinstein and Schule (2003) in accounting demonstrates the potential for professional mentors to educate students regarding the challenges and rewards of specific careers. The provision of such knowledge early in a student's college career can result in more informed choices of academic majors. Similarly, Grant (2016) finds that professional mentors can improve mentee course selection, which can benefit both underclassmen and upperclassmen by helping them identify and explore interests and better align their course decisions with their long-term career objectives.

Length of the Formal Mentoring Relationship

The length of the formal mentoring relationship also varies among programs. The commitments most often are for a semester or a single year and it is unclear if mentors and mentees can formally choose to extend their relationships beyond the initial term. An exception is the University of Southern California's Career Advantage Program (CAP), which specifically emphasizes that students who have "participated in CAP previously must reapply if they would like to return [after completing one year], and no preferential admission treatment is given to returning CAP students." When relationships are not formally extended, we would expect that successful mentor-mentee relationships will sometimes continue informally. The Villanova University School of Business' mentorship program provides an interesting contrast. Villanova allows students to participate upon major declaration during sophomore year, and is noteworthy in that "Mentees and Mentors are encouraged to talk on a monthly basis through the mentee's graduation."

Business schools should note that longer mentor-mentee relationships can benefit all parties. In the context of youth mentoring, a number of studies indicate that long-term mentoring is superior to short-term mentoring (Deutsch and Spencer 2009). Indeed, whereas mentoring programs tend to focus on the number of mentoring matches made, a superior indicator of program quality is whether the relationships are sustained over time (Deutsch and Spencer 2009). Kram's (1983) often cited research finds that longer mentorship relationships go through distinct phases over time – each of which provides different benefits. For example, after the "initiation" phase (which itself can last 6-12 months), there is a "cultivation" phase during which "the positive expectations that emerge during the initiation phase are continuously tested against reality…[and] each individual discovers the real value of relating to the other" (p. 616). Put very simplistically, time allows the mentor-mentee relationship to deepen and evolve.

Centralization of Mentoring Programs

For our sample of universities, the professional mentorship programs for undergraduate business students are sometimes part of broader university programs or sometimes run directly by business schools. These differences are worthy of evaluation, and the rich literature on organizational structure might be of value here. For instance, centralization at universities can increase coordination among multiple colleges and numerous departments (Ross 1977), promote consistency across the university, and generate economies of scale. Among many other factors, decentralization is beneficial and is increasingly likely when there is complexity (Ross 1977). For example, to the extent that the mentorship needs of students vary substantially across a university's colleges, decentralization allows faculty and staff who best understand specific disciplines to select appropriate professionals and activities.

OTHER PROGRAM DETAILS

Many of the mentorship program websites provide details that can give other institutions ideas on dimensions to consider when designing or improving their own programs. For instance, several websites disclose protocols for mentors and mentees. Regarding the expected number of meetings, we observed that monthly meeting expectations are the most common (e.g., Bucknell, Georgia Institute of Technology, Notre Dame, Washington, Wisconsin, Villanova) and that some schools expect significantly more interaction (e.g., 24 hours total mentoring expected by Fordham University and one meeting per week expected by Texas Christian University). Indiana University notes that their program includes training on "how to be both a good mentor and a good mentee," and the University of Washington program also refers to a training session. Training would seem to be a best practice given that the research literature is replete with discussions of factors leading to successful and unsuccessful mentorship relationships. Georgetown University notes that students are expected "to complete personal and professional goals assigned to you by the assigned due date." Such assignments can be an essential tool for extending and reinforcing the education provided by a mentor relationship. Schools might also consider partnering with outside organizations to provide mentorship experiences. For instance, Cornell University partners with the investment firm KKR, and Indiana University "partners with Talent Nexus [a recruitment firm] to provide mentoring opportunities for women." Schools might also consider using third-party software to manage aspects of their mentoring programs. Villanova University, for instance, employs mentoring software from Chronus Corporation in the management of their business school alumni-based mentoring program. In addition, the mentoring program information shared on school websites provides several ideas for mentor-mentee discussion topics and special events.

SUMMARY AND CONCLUSIONS

The goal of this paper is to provide an up-to-date look at the state of alumni to undergraduate student mentoring programs at business schools as a starting point for creating a repository of information about the nature and content of such programs. In doing so, the paper highlights four key points of distinction among the programs at top business schools and provides a variety of examples of program details that other schools may wish to consider. Our hope is that other schools which have created innovative and effective alumni-based mentoring programs will share their ideas so that schools looking to implement or innovate their mentorship programs will have a valuable set of resources to draw upon. Given the value of mentoring, more in-depth research into the specifics of developing and implementing alumni-based mentorship programs could be a useful line of inquiry. In addition, another promising area of research would be the examination of other types of mentoring programs, such as peer to peer, faculty to student, and graduate to undergraduate student.

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Real-World Ready Decision Making: Authentic Learning in Cost Accounting

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ABSTRACT

The use of real-world ready skill activities in accounting curriculum bridges the gap between the learning of content and the integration or application to real-life problem-solving contexts. This paper describes a problem-based-learning activity that establishes an authentic learning environment where students master competencies in accounting, quantitative methods, and technology and provide an opportunity to practice the real-world ready skill of management decision making. Specifically, the case requires students to analyze data in Excel, apply the quantitative methods of learning curve and regression, and make management decisions with the results.

Keywords: problem-based learning, regression, learning curve, decision making, Excel, technology

INTRODUCTION

As students prepare to enter the accounting profession, they are expected to develop certain competencies, including decision making and technology skills (AICPA, 2018). For decision making, authentic learning is an instructional design that promotes activities that strengthen connections between knowledge and real-life application (Cristal et. al, 2019). Problem-based learning (PBL) is one technique utilized in an authentic learning environment and one that simulates real-life, generates multiple options, promotes creative and independent thinking, requires new core knowledge, integrates several topics with realistic deliverables and outcomes, engages students and engenders curiosity, and is outcome-based (Tan, 2003). Research identifies successful use of PBL in the fields of medicine, nursing, engineering, social work, law, management, science, and business and economics (Stanley and Mardsen, 2012). Applying a PBL activity in an authentic learning environment can address some of the concerns of accounting authorities on accounting education. Accounting authorities continually stress the importance of accounting students developing professional skills, including organizational and business management skills (AICPA 2018, The Pathway Commission 2015). The concerns support the argument by Albrecht and Sack (2000) that accounting education needs to move toward teaching approaches that convey critical knowledge, skills, and abilities.

For technology skills, the accounting profession applies a variety of technologies and recommends new accountants start their career with technology knowledge and experience (AICPA 2018, PwC 2015). In addition, The Pathways Commission's Action Item 4.1.6 identified the importance of students' effective and efficient utilization and understanding of technology, giving an example that "accounting students need to be highly competent with spreadsheets" (The Pathways Commission, 2015). Spreadsheets, such as Excel, are one of the essential technologies used by accountants. Accounting students on internships often report Excel as a widely used technology in their work, providing anecdotal evidence of an expectation of some proficiency in Excel. Some interns have even reported being asked Excel questions by more experienced co-workers. To prepare students for the accounting profession, Excel is often incorporated into accounting curriculums (Rackliffe & Ragland, 2016). While Excel is incorporated into a variety of courses, those considered best suited to incorporate Excel are accounting information systems, financial statement analysis, and cost/managerial (Rackliffe & Ragland, 2016).

The case described in this paper is a problem-based learning activity used in a cost accounting course to develop decision making and technology skills using Excel to apply the concepts of regression and learning curve to a set of data and analyze the results.

LEARNING OBJECTIVES

The case is a problem-based learning (PBL) activity that satisfies two primary objectives: (1) To provide students with an authentic learning environment to develop a real-world ready skill, management decision making; and (2) To enhance the ability for students to use technology effectively and efficiently.

In the first objective, this case addresses many of the concerns mentioned by accounting authorities, including The Pathways Commission's common body of knowledge learning objectives of 1) planning, analysis, and control, 2) quantitative methods, 3) analytical thinking and problem solving, 4) technology, and 5) leadership (The Pathways Commission, 2015). Specifically, the case requires students to analyze the data using quantitative methods (regression) in Excel to problem solve the best cost driver choice. In addition, a budget for the number of estimated preparation hours and estimated support costs is prepared, which simulates a manager's responsibility.

The second objective is the ability for students to use technology effectively and efficiently. Over the semester, this PBL activity on regression and learning curves is one of four Excel assignments implemented each semester with the objectives of learning the concepts and techniques of the cost accounting material, enhancing students' Excel spreadsheet skills, and providing opportunities to develop professional skills, including a communication or decision-making element requirement. Other Excel assignments used in the cost accounting course, which vary each semester, include 1) cost-volume-profit with multiple products, 2) support cost allocation using direct, step-down, and reciprocal methods, 3) budgeting, 4) variance analysis, 5) absorption and variable costing, and 6) process costing using FIFO and weighted-average.

The objectives of the case provide students with opportunities to reinforce knowledge learned in the course, analyze data using statistical techniques, and make decisions based on the analysis. In addition, the case objectives map into the application and comprehension of Bloom's Taxonomy and satisfy some essential elements needed in accounting curriculum (The Pathways Commission 2015).

THE CASE

Intended Course and Audience
The case has been successfully used with students in a cost accounting course over multiple semesters, though not every semester as other topics are used for Excel assignments on a rotating basis. The case is assigned as an individual assignment, in which each student prepares the assignment using Excel and the grade is based on the student's proficiency in statistical techniques, analysis, decision making, and Excel skills.

Assigning the Case
The case presents an Excel assignment on the topics of learning curve and cost estimation using regression. In the assignment, students use a cumulative average time learning curve to estimate the labor hours per item after learning takes place, and then use the labor hours per item and estimated items per week to estimate total labor hours per week. Students also use simple regression in Excel to generate a cost function for each of two cost drivers, then use the regression statistics to decide which is the better cost driver to use for estimating costs. The cost function for the chosen cost driver is then used to estimate future support costs.

Students are required to copy and paste data provided in a Word document into their Excel spreadsheet. Data was provided in a Word document rather than Excel so that students would have to create a new Excel spreadsheet. Additional Excel instructions are specified within the case requirements and in an appendix to the case. The Word document with the data is available upon request to the authors.

Case Information and Data
Rita Hansen is planning to open an R&H Tax Service office for the upcoming 15-week tax season, January through April 15. She plans to offer one service, individual income tax return preparation. She wants to estimate her labor needs using a cumulative average time learning curve and estimate her support costs using regression for the 15-week season based on an estimated number of returns per week.

To staff her labor needs for the tax season, Rita plans to hire several accounting students as interns from the local university on a part-time basis to do the simpler returns while she does more complicated returns herself. Because there is a significant amount of learning that takes place in preparing tax returns, Rita wants to apply a cumulative average time learning curve to her estimate of labor needs. Rita expects the learning curve to level out after 16 returns, so the time for the 16th return is the best estimate of future return preparation. Based on her observations during training, she estimates the following:

Hours to prepare first income tax return	6 labor hours
Learning curve percentage	88%
Learning curve factor b = ln (%)/ln (2)	-0.1844246

Rita has also hired an office manager to perform administrative support duties such as answering phones, processing paperwork, filing, etc. While the returns are prepared and filed electronically, the office manager prints out and assembles a copy for the client and then notifies the client that their return is ready to be picked up. Rita wants to estimate the weekly support costs and believes she can estimate a cost function using data for the prior 15-week tax season (from January through April 15) from an office in a comparable community. Since it is uncertain which would be a better cost driver, Rita is considering either the number of returns or preparation hours. Data are listed below:

Table 1: Historical Data From Comparable Office

Week	Support Costs	Number of Returns	Preparation Hours
1	$1,289	13	78
2	1,438	19	106
3	1,711	28	87
4	1,637	23	74
5	1,532	21	89
6	2,120	46	107
7	1,761	52	119
8	2,055	63	118
9	1,383	35	96
10	1,927	44	103
11	1,836	50	132
12	1,620	38	120
13	2,184	54	144
14	2,237	63	122
15	2,378	68	137

Case Requirements

Using an Excel spreadsheet in good form (cells properly formatted) and using the original data provided in the Word document, prepare a solution for the case requirements. Follow the instructions below to (a) estimate the preparation time using a cumulative average time learning curve; (b) use regression to choose the better cost driver (number of returns or preparation hours) and determine a cost function for support costs; and (c) prepare a summary as shown below.

a. **Estimate the preparation hours per return:**
Prepare a cumulative average time learning curve schedule through 16 units. The schedule should have four columns: (1) Cumulative number of units, (2) Cumulative average time per unit, (3) Cumulative total time, (4) Individual unit time for X^{th} unit. Preparation hours per return are expected to level off at 16 returns, so the estimated hours to prepare **each** return is the "Individual unit time for the 16th unit" (Column 4 of the learning curve table). See Appendix A for instructions on raising a number to a power in Excel.

b. **Estimate support costs per week:**
For each cost driver (number of returns and preparation hours), use the data above to do the following:
1) Plot the data on two **separate** scatter graphs, one for **each** cost driver.
2) Estimate a **separate** cost function for **each** cost driver using the regression method.
3) Prepare a comparison of the cost drivers on the three criteria of economic plausibility, goodness of fit, and significance of the independent variable.
4) Based on your comparison, decide which predictor, number of returns or preparation hours, you believe is a more appropriate cost driver for estimating overhead costs.

c. **Prepare a summary with the following information:**
1) Estimated hours to prepare each income tax return (individual unit time for 16th unit)
2) Cost function $y = a + bX$ for estimating support costs using number of returns.
3) Cost function $y = a + bX$ for estimating support costs using preparation hours.
4) Identify choice of cost driver.
5) Rita estimates the number of returns for each week through the 15-week season below. She would like an estimate of the preparation hours to use for scheduling student workers, and an estimate of support costs for

budgeting purposes.

Table 2: Estimated Returns Per Week

Week	Estimated Returns	Estimated Prep Hours	Estimated Support Costs
1	10	*	**
2	22		
3	25		
4	28		
5	34		
6	35		
7	46		
8	52		
9	42		
10	37		
11	45		
12	53		
13	57		
14	69		
15	75		

* estimated returns x estimated prep hours (learning curve 16th unit). Set up your formula as: = (cell for # returns (column 2))*(cell for time for 16th unit from your learning curve)
** Use the cost function for your chosen cost driver y = a + bX. Set up your formula as: = (cell for a coefficient) +(cell for b coefficient)*(cell for X) where X is your chosen cost driver, either returns (column 2) or prep hours (column 3).

See Appendix A for more detailed Excel instructions on the case requirements.

OBSERVATIONS AND COMMENTS

Student Performance
Students tend to do well on the case with scores averaging over 85%. Two areas where students struggle include 1) identifying the labor hours per item from the learning curve to use for estimating labor hours in future weeks and 2) using the regression cost function to estimate future support costs. In identifying the labor hours from the learning curve, students wanted to use the cumulative average time for a total of 16 units (Column 2) instead of the individual unit time for the 16th unit (Column 4) for estimating future labor hours. This indicates a misunderstanding of the calculation in Column 2 of the cumulative average time which they were interpreting as the time for the individual 16th unit. For using the regression cost function, most were able to identify the cost estimation equation from the regression output but then some had trouble understanding how to use the equation to estimate future support costs.

Grading and Solutions
Overall, grading the case requires minimal time, especially when students have done it correctly. Grading becomes more challenging and time-consuming when students make numerous errors as the errors will often affect results throughout the spreadsheet. Grading does require reviewing cell contents to ensure that students have used formulas and cell references in their solution. Solutions are available upon request to authors.

Classroom Validation
After completing the case, students were asked to participate in a questionnaire regarding the case and its usefulness. Of 28 students who completed the case this semester, 20 responded to the survey. Among other things, students were asked to evaluate whether the case increased their understanding in applying a learning curve and regression with company data. It also evaluated if students believed it provided good practice in applying learning curves and developing scatter graphs and regressions in Excel. Table 3 summarizes student responses to the survey.

Table 3: Student Feedback Questions

Questions	Strongly Agree	Agree	Neither Agree /Disagree	Disagree	Strongly Disagree
1. Overall, the assignment increased my understanding of how to apply a learning curve.	15%	75%	10%	0%	0%
2. Overall, the assignment increased my understanding of how to apply regression with company data.	20%	70%	10%	0%	0%
3. The assignment provided good practice in applying learning curves.	35%	65%	0%	0%	0%
4. The assignment provided good practice developing scatter graphs in Excel.	35%	50%	15%	0%	0%
5. The assignment provided good practice developing regressions in Excel.	40%	50%	10%	0%	0%
6. The in-class discussion about learning curves and regression using company data was helpful in completing the assignment.	50%	40%	5%	5%	0%
7. The assignment was well-written.	30%	45%	20%	5%	0%
8. Overall, I felt the assignment was helpful.	25%	70%	5%	0%	0%

Overall, the student feedback was positive. The survey results in Table 1 suggest that students found the case to be useful. Ninety percent of the students agreed or strongly agreed that they obtained a better understanding of learning curves and regressions and 85 to 90 percent agreed or strongly agreed that it was good practice in doing learning curves, scatter graphs, and regressions in Excel. Overall, 90 percent of the students agreed or strongly agreed that the in-class discussion on learning curves and regression with company data was helpful in completing the assignment and overall, 95 percent agreed or strongly agreed the assignment was helpful.

Further analysis was completed using exam scores in two different semesters where learning curves and regression were tested but the Excel case was only assigned in one of the semesters and in the other semester students did the usual homework. An 11-point problem on learning curves and regression was included on an exam in both semesters. The results indicated improvements on both the 11-point problem and the overall exam score for the semester students received the assigned Excel case as an individual assignment. The results were not statistically significant and indicate that 1) students also received a learning benefit from the usual homework, or 2) the sample size of 28 students receiving the case and 20 students not receiving the case is too small to result in significance.

Other evidence, though anecdotal, was retrieved from teaching evaluations and was positive overall. Some representative examples include: "The excel assignments… really helped with working through the concepts and getting a (graded) chance to practice them." "I liked having… excel assignments, I do believe that they helped me develop a deeper understanding relating to the problems involved." The evidence of efficacy provided indicates this Excel assignment and others like it on other cost/managerial topics are helpful in enhancing students' Excel skills preparation for entering the accounting profession.

CONCLUSION

This case provides a problem-based learning activity in which students develop real-world ready competencies in quantitative analysis, decision making, and Excel technology skills. It meets the learning objectives of providing students with authentic learning to develop decision making skills and enhance students' abilities to use technology efficiently and effectively, which helps achieve the common body of knowledge learning objectives of The Pathways Commission (2015).

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APPENDIX A: ADDITIONAL EXCEL INSTRUCTIONS FOR CASE REQUIREMENTS

Excel spreadsheet in good form should contain 1) a data section and 2) a solution section. The data section should contain the data presented in the problem and any other calculations or functions needed to provide the data to solve the problem. The solution section should ONLY contain formulas, cell references (to the data section or to results of other calculations) and labels. Do not type numbers into cells or into formulas in the solution section.

Learning curve:
To raise a number to a power in Excel, use the ^ symbol (above the numeral 6 on the keyboard); for example, 10^2 would be input as =10^2 in Excel.

Scatter graphs in Excel:
Plot the data on two **separate** scatter graphs, one for **each** cost driver.
- To do the scatter graph, click on Insert in the menu bar and click on the XY (scatter) chart with dots only (no lines). Click inside the empty chart to open the Chart Design menu, then click on Select Data. Click on Add to open the Edit Series box, give your chart a name, click on the arrow for Series X values and highlight activity data (returns or hours) and click on the arrow. Do the same for Series Y values, highlighting costs, then click OK. (NOTE: Check to make sure your chart has costs on the Y (vertical) axis and activity on the X (horizontal) axis. If it is backwards, do the following: Right-click on the data points, click on "Select Data", and click on Edit. Click on the arrow icon for X values, highlight the data in the cost driver column, and click on the arrow icon again. Do the same for Y values, highlighting the costs. Click OK.)
- Move the chart to the location on the spreadsheet where you want it. Use the right mouse button to change the appearance of the graph to look the way you want it. **In particular, change the X and Y axes to start at a number other than zero**: Right-click on the Y-axis, click on Format axis, and change "Minimum" from 0 to a number slightly less than the minimum number in your data, then click the x to close. Do the same for the X-axis.
- Repeat these steps for the second cost driver.
- Examine the graphs for trends and outliers.

Regression in Excel:
- To do the regression in Excel, click on Data, Data Analysis*, and choose Regression. (*If you do not see Data Analysis under Data, it must be added by doing the following: Click on File, Options (bottom left), Add-ins. Find Manage: Excel Add-ins and click on Go… next to it, place check mark in front of Analysis ToolPak, and click OK. Then click on Data, Data Analysis, and choose Regression.)
- Specify each input range by clicking on the arrow icon and highlighting the range of cells. The Y-range is the dependent variable (cost), and the X-range is the independent variable (cost driver/activity). For the output range, click on the arrow icon, move to the area of the spreadsheet where you want the regression output, and click on the upper left cell of that area. Then click on OK.
- Repeat these steps for the second cost driver.
- Note that the output contains the calculated values, not formulas, so if you make any changes, you must redo the regression (it will not change automatically).

Manuscript Guidelines, Submission and Review Process

TOPIC AREAS (BUT NOT LIMITED TO THESE):
- Course design – current courses, new courses, new trends in course topics
- Course management – successful policies for attendance, homework, academic honesty …
- Class material
  - Description and use of new cases or material
  - Lecture notes, particularly new and emerging topics not covered effectively in textbooks
  - Innovative class activities and action-learning – games, active learning, problem based
- Major or emphasis area program design that is new or innovative.
- Assessment – all aspects including AACSB and university level assessment strategies and programs
- Integration of programs or courses with other academic disciplines
- Internship programs
- Business partnerships
- Successful student job placement strategies
- Any topic that relates to higher education business education.

SUBMISSION AND REVIEW PROCESS:

Copyright

- Manuscripts submitted for publication should be original contributions and should not be under consideration with another journal.
- Authors submitting a manuscript for publication warrant that the work is not an infringement of any existing copyright, infringement of proprietary right, invasion of privacy, or libel and will indemnify, defend, and hold Elm Street Press harmless from any damages, expenses, and costs against any breach of such warranty.

Prepare your manuscript

- See the Style Guideline page for specific instructions.
- Articles must make a contribution to business education innovation.
- Manuscripts can be any length. The first 10 pages are charged the current per page rate, and pages over 10 are charged half that rate.
- Articles can be either regular research papers, or shorter notes that succinctly describe innovative classroom teaching methods or activities.
- Manuscripts should be completely finished documents ready for publication if accepted.
- Manuscripts must be in standard acceptable English grammatical construction.
- Manuscripts should be in MS Office Word format. Word 2007 files are acceptable, as are earlier versions of Word. If you are using a new version of Word after Word 2007, save in Word 2007 format.

Submit your manuscript

- Manuscripts may not have been published previously or be under review with another journal.
- Submit the manuscript attached to an email to **submit@beijournal.com**
- We will respond that we have received the manuscript.
- Article submissions can be made at any time.
- Submission deadlines: September 15 for December issue, March 15 for June issue.

Manuscript review

- The editor and reviewers will review your submission to determine if 1) the content makes a contribution to innovative business education, 2) is of the proper page length, 3) is written in proper grammatical English, and 4) is formatted ready for publication.
- Submissions not meeting any of these standards will be returned. You are invited to make revisions and resubmit.
- If the submission meets the standards, the manuscript will be sent to two reviewers who will read, evaluate and comment on your submission.
- The editor will evaluate the reviews and make the final decision. There are 3 possible outcomes:
    - Accept as is.
    - Accept with minor revisions.
    - Not accepted.
- Reviews will be returned promptly. Our commitment is to have a decision to you in less than two months.
- If your paper is not accepted, the evaluation may contain comments from reviewers. You are invited to rewrite and submit again.

If your paper is accepted

- Minor revision suggestions will be transmitted back to you.
- Revise and send back as quickly as possible to meet printer deadlines.
- Upon final acceptance, we will bill you publication fees. See www.beijournal.com for latest per page fees. Sole author fees are discounted.
- The fees include all costs of mailing a copy of the issue to each author via standard postal ground.
- Delivery to locations outside the continental US will cost an additional $10 per author for 5 day delivery.
- Faster delivery methods are available for US and international delivery. Contact the editor for a specific pricing.
- All publication fees should be remitted within 10 business days of acceptance, if possible.
- If you decide not to publish your paper with BEI Journal after submitting payment, we will refund publication fees less $200 to cover costs of review and processing.
- Cancellation cannot occur after the paper has been formatted into the final printer's file.

Manuscript Style Guide and Example

An example is provided following these instructions.

This style guide represents style guidelines in effect for future issues, but always check for updates online.

Authors are responsible for checking for correct grammar, construction and spelling. Authors are also responsible for formatting pictures, tables, and figures such that a pdf black and white file sent to the publisher will reproduce in a readable manner.

General Setup:
- All fonts other than exceptions noted below: Times New Roman. 10 point for text. Other sizes as noted below
- Margins: 1 inch on all sides of 8½x11 inch paper size.
- No headers or footers.
- Absolutely no footnotes or endnotes via footnote or endnote formatting. For footnotes or endnotes, place a number of the footnote in the proper location as a superscript. Then at the end of the paper or bottom of the page, add the footnote as text with a superscript number to correspond to that footnote.
- Page numbering bottom centered.
- No section breaks in the paper.
- No color, including url's. Format to black. No color in tables or figures. Use shading if necessary.
- All pages must be portrait orientation. Tables and figures in landscape orientations should be reformatted into portrait orientation.
- All paragraphs should be justified left and right, single spaced, in 10 point Times font, no indent on first line, l line between each heading and paragraph.
- One line between each paragraph.

Titles, Authors, and Headings:
- # Title centered 14 point bold. One line between title and author's name.
- ## Authors: centered, 12 point. Name, affiliation, state, country.
- One line space to **ABSTRACT** (title 10 point, bold, all capitalized, aligned left; text of abstract 10 point, no bold)
- After **ABSTRACT**, one line space, then **Keywords**. Followed by one line space to first major heading.
- **HEADINGS, MAJOR**, 10 point, bold, all capitalized, aligned left.
    The specific headlines will be based on the content of the paper, but major sections should at a minimum include an abstract, keywords, introduction, conclusion, and references.
- **Sub-headings**: 10 point, bold, first letter capitalized, no line to following paragraph. Align left.
- *Third level headings: Italic*, 10 point, first letter capitalized, no line to following paragraph. Align left.
- **Keywords:** heading: 10 point, bold, first letter capitalized, no line to following paragraph. Align left.
    Your list of keywords in 10 point, no bold.

Tables, Figures and Graphs:
- All fonts 10 point.
- Numbered consecutively within each category. Table 1, Figure 1 etc.
- Title: 10 point, bold, left justify title, one space, then the table, figure, etc.
- Example: **Table 1: Statistical Analysis**

References:
- APA format when citing in the text. For example (Smith, 2009).
- References section: 8 point font, first line left margin, continuation lines 0.25 inch indent. Justify left and right. No line spacing between references. List alphabetically by first author.
- Specific references: Last name, First initial, middle initial (and additional authors same style) (year of publication in parentheses). Title of article. *Journal or source in italics.* Volume and issue, page number range.
- Example: Clon, E. and Johanson, E. (2006). Sloppy Writing and Performance in Principles of Economics. *Educational Economics.* V. 14, No. 2, pp 211-233.
- For books: last name, first initial, middle initial (and additional authors same style) (year of publication in parentheses). *Title of book in italics.* Publisher information.
- Example: Houghton, P.M, and Houghton, T.J. (2009). *APA: The Easy Way!* Flint, MI: Baker College.

Example (note that this example represents a change from previous style guides)
Evidence to Support Sloppy Writing Leads to Sloppy Thinking

Peter J. Billington, Colorado State University - Pueblo, Colorado, USA (12 point)
Terri Dactil, High Plains University, Alberta, Canada

ABSTRACT (10 point, bold, all capitalized, left justified)

(text: 10 point Times font, no indent, justified, single space, 150 words maximum for the abstract)
The classic phrase "sloppy writing leads to sloppy thinking" has been used by many to make writers develop structured and clear writing. However, although many people do believe this phrase, no one has yet been able to prove that, in fact, sloppy writing leads to sloppy thinking. In this paper, we study the causal relationship between sloppy writing and sloppy thinking.

Keywords: sloppy writing**,** sloppy thinking **(10 point, bold title, first letter capitalized, left justified).**

INTRODUCTION (10 point, bold, all capitalized, left justified).

The classic phrase "sloppy writing leads to sloppy thinking" has been used by many to make writers develop structured and clear writing. However, since many people do believe this phrase, no one has yet been able to prove that in fact, sloppy writing leads to sloppy thinking. Is it possible that sloppy writing is done, even with good thinking. Or perhaps excellent writing is developed, even with sloppy thinking.

In this paper, we study the writing of 200 students that attempts to test the theory that sloppy writing leads to sloppy thinking.

PREVIOUS RESEARCH

The original phrase came into wide use around 2005 (Clon, 2006), who observed sloppy writing in economics classes. Sloppy writing was observed in other economics classes (Druden and Ellias, 2003).

RESEARCH DESIGN

Two hundred students in two business statistics sections during one semester were given assignments to write reports on statistical sampling results. The papers were graded on a "sloppiness" factor using…

Data Collection (Sub-heading, bold but not all caps, 10 point, aligned left, bold, no line after to paragraph)
The two hundred students were asked to write 2 short papers during the semester…

Data Analysis(Sub-heading, bold but not all caps, 10 point, aligned left, bold, no line after to paragraph)
The two hundred students were asked to write 2 short papers during the semester…

DISCUSSION

The resulting statistical analysis shows a significant correlation between sloppy writing and sloppy thinking. As noted below in Figure 1, the amount of sloppy writing increases over the course of the spring semester.

Figure 1:   Sloppy Writing During the Semester
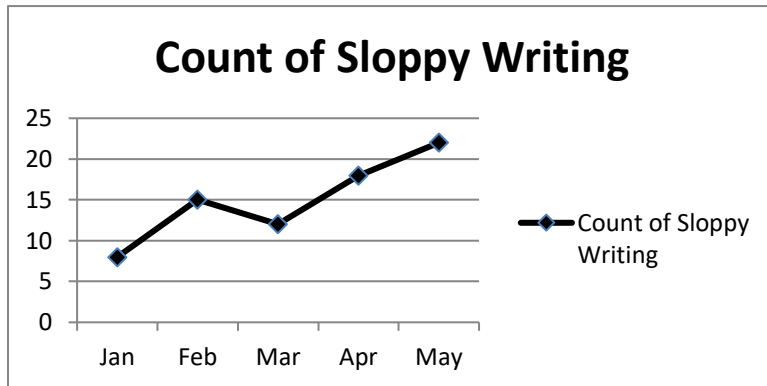
The count results were compiled and shown in Table 1 below.

Table 1: Counts of Good and Sloppy Writing and Thinking (bold, 1 line after to table, left justify)

	Good Thinking	Sloppy Thinking
Good Writing	5	22
Sloppy Writing	21	36

*-Indicates significance at the 5% level)

As Table 1 shows conclusively, there is not much good writing nor good thinking going on.

CONCLUSIONS

The statistical analysis shows that there is a strong relation between sloppy writing and sloppy thinking, however, it is not clear which causes the other…

Future research will try to determine causality.

REFERENCES (title10 point, all caps, bold, align left, one line to first reference)
        (1line spacing) (All references 8 point, indent second line 0.25 inch, justify left and right)

Clon, E. (2006). Sloppy Writing and Performance in Principles of Economics. *Educational Economics*. V. 14, No. 2, pp 211-233.
Devad, S. and Flotz, J. Evaluation of Factors Influencing Student Class Writing and Performance. *American Journal of Farming Economics*. V. 78, Issue 3, pp 499-502.
Druden, G. and Ellias, L. (1995). *Principles of Economics*. New York: Irwin.

        (short bio section optional, can run longer than these examples; removed before sent to reviewers)
Peter J. Billington, Ph.D., is a professor of operations management at Colorado State University – Pueblo. His research interests include lean six sigma and innovative education.

Terri Dactil, Ph.D., is a professor of business communication in the College of Business at High Plains University, Alberta, Canada. His research interests include instructional methods to improve student communication skills.

Endnote: (do not use word footnote or endnote formatting to accomplish this; see comments above)

Build final on 2-4-24